American Gas Association MONTHLY

Public Responds in Emergency

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It's Distribution Not Supply

•

Dehydrated Foods and the War

•

Home Service Tangible Asset

•

Converting Stoves to Bombs

February 1943

VOLUME XXV NUMBER 2

"Ladies, here's how you can help cook a tank!..."

"Funny thing! We women understand why sugar, coffee, gasoline and oil have to be rationed . . . but few of us dream that the Gas that cooks our breakfast bacon is also a vital war material!

"It probably never occurs to us that we are actually helping to build a tank or a plane or a ship or a gun when we avoid wasteful use of Gas in cooking and especially in house heating and water heating.

"For Gas is used in making nearly every kind of weapon we need to win the war!

"We women have always known that Gas is the fastest cooking fuel, that it's completely flexible and easy to control. So we can easily understand why Gas is important in helping to give our fighting forces better equipment—that it's speeding production in order that our boys may finish the job over there and get back home.

"So let's all remember . . . it's just as patriotic to use Gas wisely as it is to make the many other sacrifices that are needed for Victory!"

MEETING WARTIME NEEDS

1. For Gas fuel. Today the Gas industry is producing more Gas than at any time in history. Yet because of the difficulty in transporting fuel oil and coal to make manufactured Gas—and because of the shortage of materials with which to enlarge plants or build new natural gas pipe lines—there may be times in some sections when the demands of war production will reduce the amount of Gas normally available for household use. It is for these reasons you are urged to use Gas wisely.

2. For nutrition information. If you are one of the 85 million who depend on Gas for cooking, feel free to ask your Gas Company for the latest information on preparing nutritious wartime meals.

AMERICAN GAS ASSOCIATION

Buy War Bonds today — save for the Certified Performance Gas range of tomorrow.

GAS *is vital to war production ... use it wisely!*

American Gas Association MONTHLY

CONTENTS FOR FEBRUARY 1943

The spotlight during these winter days, at least on the Eastern Seaboard, is on gas emergencies created by the unprecedented oil shortage. Consequently, this issue leads off with stories of how two companies through preconceived campaigns were able to avert a threatened crisis in meeting peak load demands. It's a heartening picture of voluntary consumer response. . . . Turning to natural gas, we present a fact-filled article compiled by The Wall Street Journal *which gives a bird's-eye view of the cause of natural gas shortages. . . . The motor vehicles committee continues to do a bang-up job of keeping the utility operators informed of latest ODT rulings and interpretations, and their current effort is up to their previous high standard of achievement. . . . Dehydrated foods, a war baby which threatens to emerge as a healthy business with gas load possibilities, is thoroughly reviewed in Mr. Heisterkamp's fine article. It's a timely presentation of a revitalized field. . . . For hard-headed management and statisticians who demand that all projects stand on their own feet as revenue producers, the article on tangible assets of Home Service is an eye-opener. It adds fuel to the already potent arsenal of an invaluable utility prop.*

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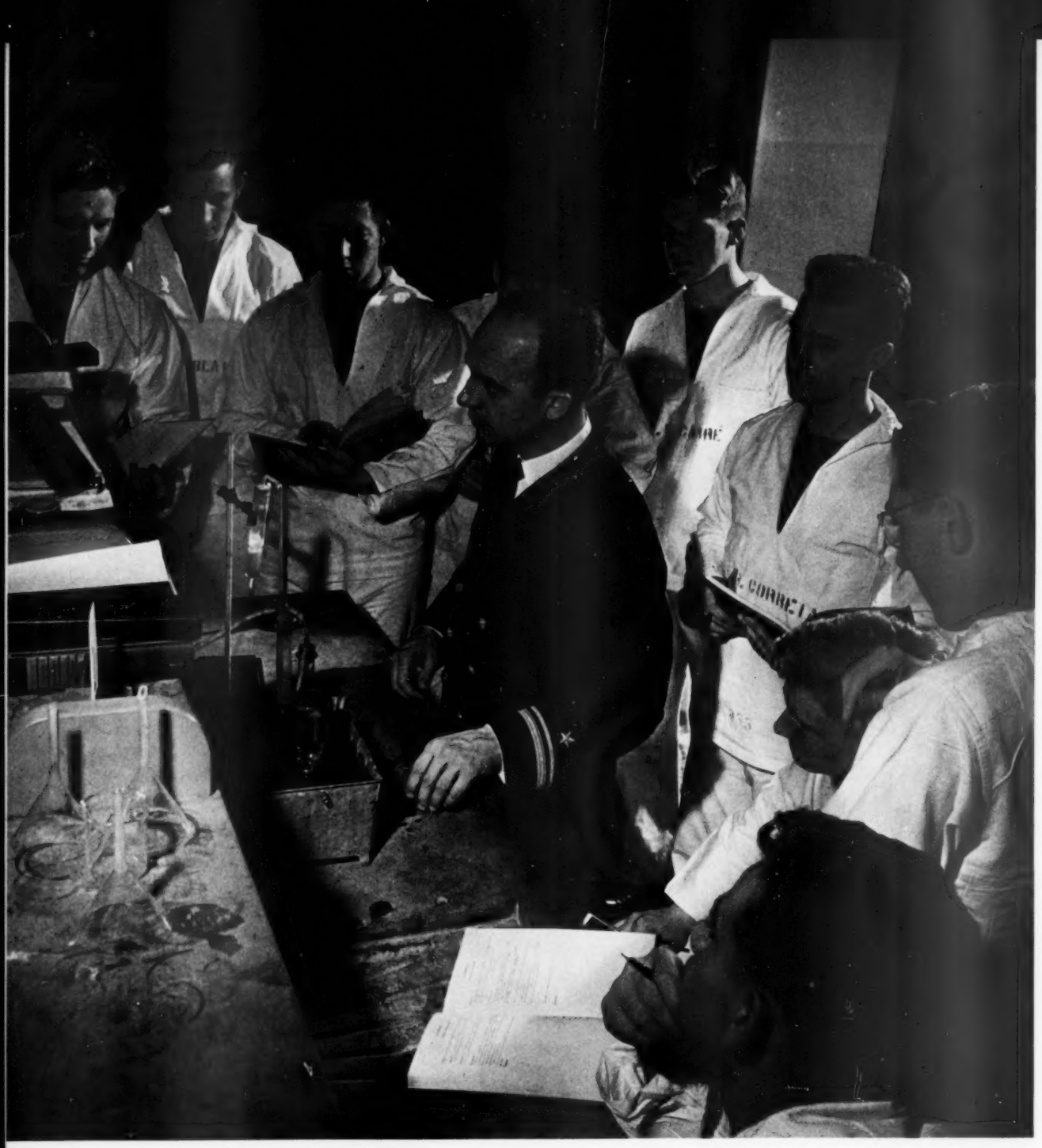

Lieutenant J. B. Heinicke instructing a wartime class in chemistry at the Annapolis Naval Academy. Prior to joining the Navy, Lt. Heinicke was employed by the American Gas Association Testing Laboratories in Cleveland. For news and pictures of other Laboratories' engineers in war service, turn to page 62.

American Gas Association MONTHLY

JAMES M. BEALL, *Editor*

CRISIS AVERTED

. . . Public Responds to Gas Emergency Program

By M. HARLOW NORTH

Blackstone Valley Gas and Electric Co., Pawtucket, R. I.

THE Blackstone Valley Gas and Electric Company, like many another New England gas company, was seriously threatened with a demand for gas beyond its capacity during the cold spell of December 20 and 21. The emergency was successfully met by quickly instituting an emergency procedure for which we started planning last summer.

Before outlining this procedure, it might be well to state some pertinent facts concerning our territory and the characteristics of our gas load.

The territory served by the Blackstone Valley Gas and Electric Company is the highly industrialized, densely populated Blackstone Valley of Rhode Island which includes the cities of Pawtucket, Woonsocket and Central Falls and the towns of Lincoln, Cumberland and North Providence.

A large portion of Blackstone Valley industry is busily engaged in war production and our industrial load is heavier than ever before, and growing. Annual sales of gas to industrial-commercial users amount to 35% of our total.

Our company was one of the pioneers in the promotion of space heating in New England and over the years has built up a space heating load which now amounts to 24% of our annual gas sales. Residential sales of gas amount to 41% of our total annual sales.

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The large majority of our residential customers live in multiple dwellings of the so-called tenement type, most of which have no central heating facilities. For this reason, a very large proportion of our residential customers heat their homes with ranges and stoves of various types equipped to burn range oil. Many of these appliances are a combination type so that either gas or oil may be used for both cooking and heating. In many cases separate gas ranges and cooking stoves equipped to burn oil are used in the same kitchen.

In our territory with 36,000 residential customers, approximately 18,000 applications for range oil were filed with local rationing boards.

While we have more than sufficient capacity to supply our normal peak heating and residential loads on top of a heavy industrial load, we realized when the oil shortage started to develop that we could not hope to meet the extraordinary demand which would inevitably arise if a prolonged spell of severe weather came at a time when the local range oil supply was low, and if large numbers of our residential customers resorted to the use of their gas ovens for heating. Accordingly, we started formulating plans and setting up an emergency organization and procedure last summer.

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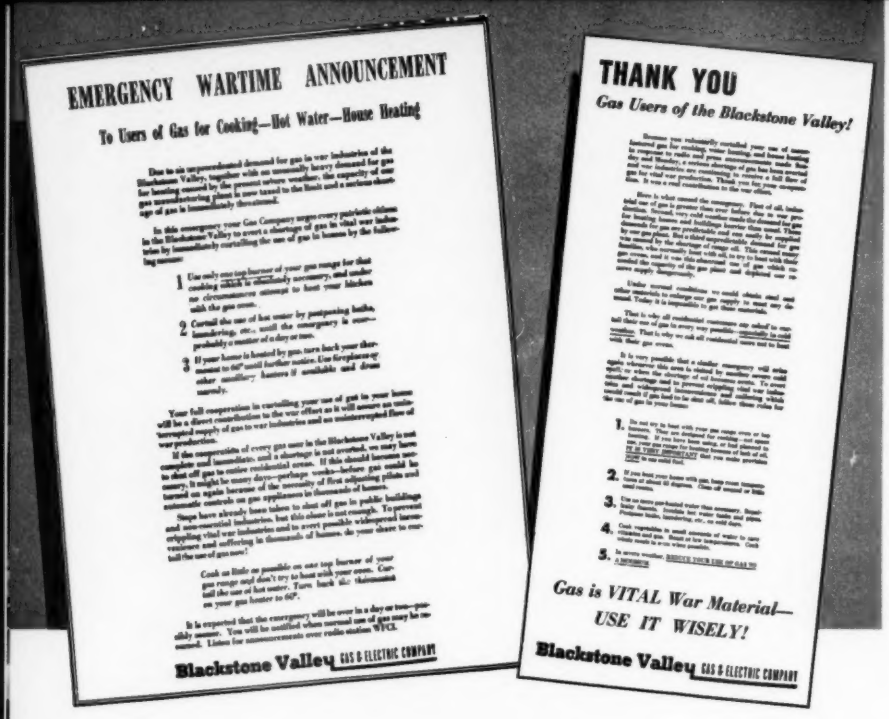
Before the heating season started by means of a letter we requested our heating customers to conserve fuel by installing storm sash, weather stripping and insulation, to close off unused or little-used rooms and to avoid setting their thermostats higher than necessary.

We also compiled a telephone list of larger commercial heating customers and non-essential industries. This list was made in card form and the card for each customer contained information as to the type of business, type of heating equipment, consumption and any other information that would enable us, when the time came, to make a reasonable request for gas curtailment and to offer specific suggestions for effecting it.

Our Industrial Service Department interviewed the proper officials of our large industrial plants to acquaint them with the possibility of a gas shortage and to learn just what temporary curtailment each could make without affecting production seriously.

In November our District Representatives were instructed to watch while reading meters for unusual increases in gas consumption which might indicate use of the oven for heating. Whenever the District Representa-



tives found such increases, they explained the company's position to the customer and requested her not to use the oven for heating.

A series of newspaper advertisements on general gas conservation was started early in December.

Arrangements were made with the Pawtucket radio station, WFCI, to release prepared announcements upon notice. The manager of the station agreed to broadcast our initial announcement upon notification of the emergency and to follow through with shorter announcements as often as time was available until the emergency was over.

A full-page newspaper announcement was prepared and given to the *Pawtucket Times* and the *Woonsocket Call* with instructions to hold it in readiness for publication on short notice.

We mailed a second letter to all heating customers advising them of the possibility of a gas shortage and giving specific instructions for curtailing their use upon notification by radio and newspaper. As it happened, the timing of this letter was fortunate. It was mailed December 16, reaching our customers just three days before the emergency occurred.

Although there was no way of forecasting when the expected emergency would occur, really severe weather does not often come before January in this locality and our guess was that we would have no trouble until January or February.

The emergency came sooner than expected but it did not catch us unprepared. Our preparations were complete for reaching the mass of our customers by radio and newspaper on short notice, and for getting in touch with individual large users by telephone.

Critical Oil Shortage

A serious range oil shortage developed locally around December 15 and became critical when cold weather, December 18 and 19, further depleted supplies in the hands of local distributors.

On Sunday, December 20, the temperature dropped below zero in the early morning hours. Our Sunday heating and cooking loads were extra heavy because the severe weather kept most residential customers at home. Partially offsetting these heavy demands was a small reduction in our industrial load due to Sunday operation, but we knew that a good deal of gas was being used for heating through gas ovens because many homes were caught without sufficient oil on hand. Many customers whose oil supply was not actually gone were probably conserving what did remain by using their gas ovens.

The hourly sendout increased rapidly throughout the morning, and at one o'clock, with the hourly sendout at an all-time high and no relief either in temperature or oil supply in prospect, it was decided to put into effect our emergency procedure.

The initial radio announcement was broadcast at 2:30 P.M. over station WFCI, Pawtucket, and shorter announcements were broadcast at frequent intervals through the afternoon and evening. To get maximum radio coverage we called on the three nearby Providence Stations, WEAN, WJAR and WPRO, to broadcast short announcements direct to gas users in the Blackstone Valley. Despite the fact that Sunday night radio time is all taken up with national network programs, the three Providence stations combined managed to give us seven short announcements during station breaks or in news broadcast periods between 5:30 and 11:15 P.M. Announcements were continued over the local station throughout Monday.

Hourly Gas Sendout

Following is a table showing hourly sendouts and temperature readings from 6 A.M. Sunday to 6 A.M. Tuesday:

	Sunday, December 20		*Monday, December 21*	
Hour	*Sendout Mcf.*	*Temp. (°F.)*	*Sendout Mcf.*	*Temp. (°F.)*
6 A.M.	259	—6	303	0
7	282	—6	323	0
8	316	—5	348	0
9	357	—4	378	0
10	409	—2	429	2
11	477	1	454	6
12 Noon	462	4	369	8
1 P.M. (Max.)	485	6	276	12
2	447	8	289	16
3	348	10	285	16
4	285	12	347	15
5	299	9	437	14
6	334	8 (Max.)	462	14
7	387	8	348	14
8	397	6	319	13
9	313	4	273	12
10	278	3	295	12
11	241	3	242	12
12 Midnight	246	2	219	12
1 A.M.	259	0	205 (Tuesday)	10
2	220	0	193	10
3	243	0	231	9
4	260	0	232	6
5	275	0	243	8

All the radio stations cooperated fully in the emergency, handling our announcements as a public service. The local station was particularly cooperative and we feel that the radio publicity was the greatest single factor in averting the serious shortage.

Sunday afternoon and Monday morning we telephoned our large industrial users, commercial heating customers and many non-essential industries. Their willingness to cooperate was very gratifying. We learned that in many cases customers we called had already curtailed gas usage as a result of our radio announcements.

Monday, with very slight moderation in temperature and with a somewhat heavier industrial load our early morning sendout was larger than Sunday morning and this caused some alarm. However, around noon it began to drop off and the Monday peak was not nearly so high as on Sunday.

The sendout for Sunday established a new record at 7,916 Mcf. Monday's sendout was 7,505 Mcf. During the cold spell new 3-day and 7-day records were also established. Our previous record sendout was 7,140 Mcf. on February 3, 1942.

Public Cooperates

Although we have no very tangible evidence to show how much curtailment was effected by our publicity, the accompanying table of hourly sendout and temperatures, analyzed in the light of known loads and past peak day experience, indicates to us that the combined radio, telephone and newspaper appeals substantially reduced the use of gas and ironed out the hourly peaks.

These conclusions are borne out by many instances reported to us from various sources of the whole-hearted cooperation of the public. These reports indicate that housewives gen-

INITIAL RADIO ANNOUNCEMENT

Announcer: We interrupt this program at the urgent appeal of Mr. David Daly, President of the Blackstone Valley Gas and Electric Company, to make a war time emergency announcement to all users of gas for cooking, water heating and house heating in Pawtucket, Woonsocket, Central Falls, North Providence, Lincoln, Cumberland.

Due to an unprecedented demand for gas in war industries of the Blackstone Valley together with an unusually heavy demand for gas for heating caused by the present severe weather, the capacity of the gas manufacturing plant of the Blackstone Valley Gas and Electric Company is now taxed to the limit and a serious shortage of gas is immediately threatened.

The Blackstone Valley Gas and Electric Company urges every patriotic citizen in the Blackstone Valley to avert a shortage of gas in vital war industries by immediately curtailing the use of gas in homes by the following means:

1. **Use only *one top burner* of your gas range for that cooking which is absolutely necessary, and under no circumstances attempt to heat your kitchen with the gas range oven.**
2. **Curtail your use of hot water by postponing baths, laundering, etc., until the emergency is over—probably a matter of a day or two.**
3. **If your home is heated by gas, turn back your thermostat to 60° and turn off the radiators in all rooms you can close until further notice over this station. Use fireplaces or other auxiliary heaters if available and dress warmly.**

Your full cooperation in curtailing the use of gas in your home will be a direct contribution to the war effort as it will assure an uninterrupted supply of gas to war industries and an uninterrupted flow of war production.

If the cooperation of every gas user in the Blackstone Valley is not complete and immediate, and a shortage is not averted, the Blackstone Valley Gas and Electric Company may have to shut off gas to entire residential areas. If this should become necessary, it might be many days—perhaps weeks—before gas could be turned on again because of the necessity of adjusting automatic controls on each individual gas appliance in thousands of homes.

To prevent crippling war industries and to avert possible widespread inconvenience and suffering in thousands of homes, do your share to curtail the use of gas now!

***Remember*—all gas users in the Blackstone Valley are asked to—**

Cook as little as possible on *one* top burner of your gas range, and don't try to heat with your gas oven.

Curtail your use of hot water.

Turn back the thermostat on your gas heater to 60° and shut off rooms.

The emergency is expected to end in a day or two—perhaps sooner. Listen for further announcements.

30 WORD ANNOUNCEMENT BROADCAST DURING STATION BREAKS

Emergency announcement! The Blackstone Valley Gas and Electric Company urges all users of manufactured gas in the Blackstone Valley to curtail use of gas immediately. A serious shortage is threatened.

FOLLOW-UP ANNOUNCEMENT BROADCAST WHENEVER RADIO TIME WAS AVAILABLE

Emergency! Cold weather has caused a serious manufactured gas shortage in the Blackstone Valley. Vital war industries are threatened with shutdowns. *These must be avoided.* Every patriotic citizen in the Blackstone Valley is asked to save gas NOW. Here's how to do it: *Don't use your gas oven* for any purpose until further notice. Use only one top burner of your gas range for that cooking which is absolutely necessary. *Use as little gas-heated water as possible.* Postpone baths and laundering. If you heat with gas, *set thermostat at not more than 60 degrees.* If your cooperation is not complete and immediate it may become necessary to shut off gas to entire residential areas. This is a wartime emergency. Do your full share to keep war industries going. Save gas NOW. The emergency is expected to end in a day or two—perhaps sooner. Listen for further announcements.

erally throughout our territory followed our suggestion to use one top burner only on their gas range.

Our Heating Department has learned that in several instances heating customers turned back their thermostats as far as they would go and left home to stay with friends or relatives.

One barber shop proprietor in Pawtucket turned off his gas water heater and operated all day Monday using cold water. If customers complained he told them he was doing his part to help the gas company keep war industries going.

One gas heating customer, whose automatic controls failed and turned off his boiler soon after he heard our radio announcement, assumed that the gas had been turned off by the company and without calling us or complaining packed a bag and registered in a hotel.

Two days after we had notified the public that the emergency was over and that normal use of gas could be resumed, a customer with the voice of a sweet old lady called the plant superintendent to ask him if he thought it would be all right if she baked a pie.

Tuesday morning about 9 o'clock the temperature began to rise and a snow flurry signalled the break in the weather we had been awaiting. We immediately followed through with radio and newspaper announcements that the emergency was over. We made a particular point of thanking our customers for their cooperation and giving a full explanation of the causes of the threatened shortage. We gave the public full credit for averting the shortage and keeping the war production lines rolling. We also called back those customers we had telephoned with a similar message.

We feel that this follow-through on our publicity will be of great value when and if we must appeal to our customers again under similar circumstances. And we realize full well that the same situation may arise again. At this writing the range oil supply is desperately low in our territory and there is little hope of any great improvement during the remaining months of the winter.

The next time the sendout starts sky-rocketing, however, we will have at least a little knowledge of this new gas man's nightmare, the gas-oven-space-heating load. And we will have also a new faith in the response we may expect from an appeal to our customers.

Notes on City Gas for Air Raid Wardens

A 12-PAGE pamphlet entitled "Notes on City Gas for Air Raid Wardens" has been published by the United States Office of Civilian Defense, Washington, D. C., and has proved a valuable guide to local defense officials and others. The pamphlet is based on material prepared by the American Gas Association and is available at 5¢ per copy from the Superintendent of Documents, Washington, D. C., or may be secured at local Civilian Defense offices.

The purpose of the bulletin is to provide the air raid warden with definite information about city gas which will be of direct help in the event of bombing or other attack in his area. It describes the gas distribution system, including location of street valves and meter cocks, and points out action to be taken when damage to a gas system has occurred.

PUBLIC COOPERATES IN WASHINGTON GAS EMERGENCY

RADIO ANNOUNCEMENT (All local stations, every 15 min.) 6—8:30 A.M. Dec. 21, 1942

This is an emergency appeal by the Washington Gas Light Company.

The low temperature this morning has resulted in loads on the Washington Gas Light Company's system far heavier than ever experienced before.

So far there is no question about *making* enough gas —rather it is due to not *yet* having enough *pumping* capacity installed, to push the gas out from the plants to your homes and stores, that has created the emergency.

The critical time is from now until ten o'clock this forenoon.

Until this emergency period is over, Washington Gas Light Company asks:

First: that from now until ten o'clock this morning you confine the use of your gas range to *not more than two top burners. Do not use the oven on your gas range.* Let me repeat—Do *not use the oven on your gas range.*

Second: if your home or store is heated by gas, please set your furnace thermostat back to *sixty* and keep it not over sixty until ten o'clock today.

This is not an appeal based on the general theme of conservation. It is an *emergency* appeal. To fail to comply with these requests during this relatively brief period, will result in a breakdown of Washington Gas Light Company's gas service within the next few hours in the metropolitan Washington area.

The appeal applies to gas users in Virginia and Maryland as well as in the District of Columbia.

The Washington Gas Light Company will deeply appreciate your cooperation in this emergency and will be doubly appreciative if you will get wofd to your next door neighbor, who may not be listening to this broadcast.

This is all you have to do:

First: until ten o'clock this morning please confine the use of your gas range to *not more than two top burners* and please do not use *any oven burner.*

Second: if your home or store is heated by gas please set your furnace thermostat back to sixty and keep it not over sixty until ten o'clock this forenoon.

NEWSPAPER ADVERTISEMENT, December 22, 1942

...and the Public Came Through!

The temperature plunge yesterday morning provided the first critical test of the Washington Gas Light Company's heavily burdened distribution facilities. In the early morning hours it became increasingly apparent that only an immediate concerted effort by the gas consuming public of greater Washington could avert a breakdown in the city's gas supply. Accordingly, a radio appeal was broadcast at frequent intervals over all local stations, urging prompt curtailment. AND THE PUBLIC CAME THROUGH.

Washington Gas Light Company extends its sincere thanks to its customers, without whose help a serious situation would have developed. Already made aware of the constant need for conserving gas, a war fuel, there was immediate response to the emergency call on the part of consumers everywhere. The people of greater Washington will be kept advised should similar emergencies again occur, with full confidence that once again, if need be, the public will come through.

WASHINGTON GAS LIGHT COMPANY

EDITORIAL, Washington Post, December 24, 1942

The Washington Post

Registered in U. S. Patent Office.

An Independent Newspaper. (Published every day in the year.)

Thursday, December 24, 1942

Object Lesson

There has been so much criticism, official and otherwise, of public cooperation in the conservation program that it is a pleasure to record an outstanding instance of wholehearted local support. That was the immediately reduced consumption of gas on Tuesday morning at the request of the Washington Gas Light Co. Early that morning a representative of the company went on the air with an appeal to use less gas during the hours immediately ahead. This was apparently necessitated by enormously increased consumption as a result of the cold wave. Repeated appeals to turn down thermostats in gas-heated homes and stores and to limit use of gas stoves brought such a gratifying response, according to the company, that by 10 o'clock in the morning resumption of the ordinary use of gas was possible.

There was, it should be noted, no compulsion involved. The public was merely asked to cooperate—and did. Since there will be somewhat limited gas supplies for some time, the presumption is that another occasion may arise when it will be similarly advisable to limit use. And, in any case the need for sparing use right along should be self-evident. The incident Tuesday, however, was in the nature of a comforting revelation and, we trust, an augury to confound critics of the public.

It's Distribution . . . *Not Reserves That Causes Wartime Natural Gas Shortages**

GAS fuel, one of the nation's prime energy resources, may not be in adequate supply in certain areas of the country during 1943. This does not imply that there is not sufficient gas, but that distribution facilities to areas which need larger quantities are not available.

Gas embraces the natural product, mixed gas and artificial gas. The reserves of the natural product unfortunately are situated in areas far removed from important demand centers. It then becomes a problem of transmission to where the gas is needed.

Currently, the areas of greatest demand for natural gas are areas of dwindling supply. The problem becomes one of balancing supply and demand geographically, and will, in the opinion of gas engineers, be more acute after the war.

Proved Gas Reserves

Of natural gas, engineers estimate that the country's proved reserves range from 80 to 90 trillion cubic feet, with a potential probably twice that size.

The total reserve position has been expanding steadily since 1928 but in certain areas, such as in the Appalachian region, there has been a tendency for a slow decline, especially in Pennsylvania and New York, and possibly West Virginia. In recent years new, deeper exploration has been helpful in the latter state, but the longer term prospect indicates a declining trend.

Demand for natural gas has been steadily upward, barring a recession in the depression years 1931-1933. In 1941, production and deliveries to consumers approximated 2.6 trillion cubic feet, an increase of 70% from the depression low of 1933, when similar demand, countrywide, amounted to 1.5 trillion cubic feet. As a result the estimated reserves currently approximate slightly better than 25 years' demand.

The pinch on natural gas supplies, according to engineers, most likely will be felt first in the Appalachian region which embraces the states of New York, Pennsylvania, Kentucky, West Virginia and Ohio, where practically all is used in plants devoted to war purposes. Should the war last another year or two it will, in all probability, develop a critical situation in this important consuming area.

Gas deliveries in 1942 in the Appalachian region are estimated in excess of 400 billion cubic feet, and 1943 is expected to show a similar, or slightly larger, total.

In this region, although estimated reserves are about 5 trillion cubic feet, equal to more than 12 years' supply at current rate of withdrawal, it is a problem during winter months, when peak demand is experienced, to supply surrounding markets. It has required that every well be opened to maximum production and every horsepower of compressor capacity be put into service.

Largest Reserves in Southwest

Recently the Tennessee Gas & Transmission Co. of Chattanooga, Tenn., filed with the Federal Power Commission for a certificate of public convenience and necessity to construct and operate a natural gas pipeline from southwestern Louisiana gas fields to Nashville, Chattanooga, Knoxville and other Tennessee communities. The company also proposes to deliver gas through the facilities to existing pipe line companies for transmission into Ohio and Pennsylvania to relieve a threatened gas shortage in the Appalachian area.

The nation's largest natural gas reserves are in the Southwest—Texas, Oklahoma, Arkansas, southwestern New Mexico, Louisiana and Kansas. Here, engineers estimate, are approximately 70 trillion of the 80 to 90 trillion of the country's proved reserves. From the producing fields the gas is piped to the North Central, Middle West and the southeastern areas.

Some expansion of transmission facilities has taken place in recent years, but currently there is posed the problem of priorities on materials. It is inevitable that transmission facilities must be expanded. Industry, itself, is working on many extensions and enlargements whereby facilities are being reclaimed in operations of systems where there is greater need, and in some cases new materials are being furnished to build these expansions.

Pipe-Line Transmission

Natural gas pipe line transmission expanded from 57,000 miles in 1928 to 90,000 in 1941. Further expansion took place in 1942.

While natural gas has for many years been used principally for heating and for generating steam and electric power, the tempo of research and development has increased enormously and a much higher field of utilization is seen in the conversion of hydrocarbons into many chemical derivatives.

Such research, in recent years, has embraced the development of superior aviation fuels, lubricants, synthetic rubber, explosives, acetylene, anaesthetics, plant life promoters, plastics, solvents and many others. Some of these processes are already in commercial use in the petroleum refining and other industries.

In the North Central group of states, embracing Indiana, Illinois and Michigan, where estimated recoverable reserves of natural gas are 200 billion cubic feet, there has been no problem of supply for this product, but there has been difficulty in furnishing mixed gas to some areas. Recently in Indianapolis, Ind., householders were asked to make a voluntary reduction

* Reprinted from *The Wall Street Journal*, Jan. 4, 1943.

of 10% in the use of gas by the Citizens Gas & Coke Utility to avert a shortage. A critical shortage of fuel oil used in the manufacture (enriching) of gas is responsible, plus the fact that Indianapolis industries have increased gas consumption 78% since 1940.

Detroit, which is in this region, gets about 70% of its natural gas supply from Texas and Kansas, with the remainder being furnished by the state's own fields. New lines are being built to supply the southern and eastern parts of Michigan from the southwestern gas fields.

Shortage of Transmission Lines

While there may be no apparent shortages of natural gas, there is a shortage of transmission lines. Moreover, in many instances the natural product is mixed with artificial, and there is also manufactured gas.

The total industrial and commercial sendout of manufactured, mixed and natural gas increased from 1,144 million cubic feet in 1940, to 1,323 million in 1941 and 1942 probably showed a larger rate of increase. This, it should be emphasized, does not include household use.

Early in 1942 the gas industry was serving nearly one million commercial customers and 100,000 industrial users. Send-out to industrial consumers alone increased 18% in 1941.

Contributing to this growth has been the extension of natural gas pipeline to new areas and new lowered rates. In addition there has been the variety of uses to which it could be put in industrial activity.

The industry is well in step with the requirements of current industrial practice, especially in the fields of metal heating and heat-treating.

Gas Companies and Government Study Oil Shortage on Eastern Seaboard

Ernest R. Acker

AT a meeting in New York on January 14 representatives of 46 companies in Petroleum Administration District 1 (the Eastern seaboard) using heavy oil in gas manufacture canvassed the fuel oil situation and discussed suggested government orders which would result in deciding the kind of oil to be used in gas manufacture. Ernest R. Acker, Chairman of the American Gas Association Committee on War Activities, presided at the meeting which was addressed by Alexander Macomber of Boston, representing the War Production Board.

Subsequently, on January 18, the Petroleum Administration for War issued Petroleum Administrative Order No. 3 restricting deliveries of fuel oil in District 1 to certain users but not for the production, generation, transmission or distribution of manufactured or natural gas. This was followed on January 20 by a letter from Herbert S. Marks, acting director, Power Division, WPB, to manufactured gas utilities pointing out that, despite the preferred status of gas utilities under Administrative Order No. 3, the problem of fuel supply "is so critical that interruptions in deliveries may occur at any time."

Mr. Marks said that individual companies were not justified in relying upon the possibility of maintaining normal stocks but "must be constantly prepared to put into effect emergency curtailments of gas load in the event of unavoidable interruptions in deliveries of oil." He strongly urged every company to cooperate to the utmost in the WPB and A. G. A. conservation programs.

Oil Order Pending

At the meeting January 14 it was made clear that the issuance of an order by the WPB or by the Petroleum Administration for War prohibiting oil companies from delivering or gas companies from receiving heavy oil for gas manufacture had been deferred, but that the oil crisis had not yet been reached and action was to be expected. During the interim the manufactured gas companies in the East using heavy oil were expected to use every possible method to educate domestic customers in conservation and in the possibility of curtailment of their gas supply. They were requested to study their own production situation as regards voluntary substitution of distillate light oils, to consider the possibilities and conduct representative experiments where practicable in the utilization of low octane gasoline and to keep their additional costs and other data fully reflective and up to date.

The results of tests on the use of gasoline for gas-making purposes, made in Kingston, New York and at Fond du Lac, Wisconsin have already been reported in the December and January issues of the AMERICAN GAS ASSOCIATION MONTHLY. Other tests are now being conducted in Marysville, Michigan and Burlington, Wisconsin, where light oils only are used, and the results will soon be made available to the gas industry.

There was discussion at the meeting January 14 of the additional costs resulting from changes in present gas manufacturing processes and it was indicated that studies of the companies' financial situations would be made by the Office of Price Administration.

At prior meetings, the results of which were described in memoranda to the interested gas companies, dated November 20, December 19, and January 6 the following facts were brought out:

Gas Manufacturing Data

In the OPC proposal to substitute light oil for heavy oil, it is assumed that the "distillate gas oil" to be made available in place of heavy oils will be an uncracked gas oil of sufficiently satisfactory quality and uniformity to permit its use for water gas enrichment in existing equipment and that every effort will be made to assure continuity of supply as a safeguard to vital industrial and civilian services. The principal purposes to be accomplished through the proposed substitution was said to be the relief of a serious shortage of Bunker "C" oil plus a shortage of coil cars used in the shipment of heavy oils.

Prior to the past ten or fifteen years it was the general practice of the manufactured gas industry to use light gas oils for water gas enrichment and much of the existing water gas equipment was designed and built for the use of such oils. During that period, however, the availability and price of heavy oils have resulted in a wide-spread shift to crude, Bunker "C," and residuum oils in the interest of lower production costs and increased water gas set capacities.

In reviewing the proposal that companies return to the use of light oils it was pointed out that consideration must be given to wide differences in operating practices which are characteristic of the industry because of fundamental differences in local conditions of supply and demand. These differences, which make it virtually impossible to submit one statement applicable to all companies, to indicate the effect of the proposed substitution, are the result of many variable factors, some of which are as follows:

Different types of manufacturing equipment; Varying ratios of water gas to gases produced by other processes; Differences in standby plant availability and operation; Differences in storage facilities; Differences in ratio of solid to liquid fuels; Availability of varying types of solid and liquid fuels in particular locations; Differences in transportation facilities available to geographical location.

ODT Orders Clarified . . . *A. G. A.*

Committee Reviews Regulations for Operators

ODT Order No. 21

THE opinions and recommendations of committee members on the terms of Office of Defense Transportation Order No. 21 and the reports necessary under the order are supplemented by interpretations rendered subsequent to the committee meeting by the management of Regional Office No. 2 ODT. Where these interpretations did not agree with the opinions expressed by committee members, the interpretation of the Regional Office management has been accepted and appears in the recommendations.

1. Service Vehicles

Vehicles used primarily for transporting materials from storeroom to job, job to job, vendor to job, or public loading platform to job and vehicles used in servicing appliances in the homes or places of business are

* See footnote on next page.

By the Committee on Operation of Public Utility Motor Vehicles

Linn Edsall, Chairman

service vehicles. Vehicles used in the delivery of merchandise, in hauling between storerooms, in hauling from vendor to storeroom or public loading platform to storeroom are non-service vehicles. If a service vehicle is used for any of these latter purposes, non-service vehicle operating records must be maintained for that portion of its use.

This interpretation of ODT is based on their opinion that inter-storeroom hauling or any transfer of material for storage is a type of hauling that could be performed by a common carrier and therefore could not be considered as an operation requiring a particular type of service truck as owned by utilities.

Amendment No. 3 makes the posting of any data except tire inspections on the back of Fleet Unit Certificates unnecessary and also makes it unnecessary to maintain any weekly record of operation. Records of mileage, gasoline consumption and similar operating statistics, if previously maintained on a monthly basis, will be satisfactory. The method used in accumulating these records is of no interest to ODT, nor is the method used in accumulating the records of trips and units carried. An office record of tires drawn from stock must be maintained and it will probably be found by operators that some other tire inspection record will be required by OPA when requests for certificates to purchase new tires or retreads are presented.

The following recommendations refer to the ODT quarterly report form and the numbers are the item numbers as they appear on this form.

*1. Trips operated—Must be reported for all vehicles.

As reported in the January issue, the Technical Section's Motor Vehicles Committee met in December to analyze ODT Order No. 21 and gasoline regulations. This report is a condensation of the minutes of that meeting and contains valuable information for the public utility fleet operator. In fact, this material was considered so helpful that copies of it were requested by ODT officials for distribution at their Regional Offices.

As this issue goes to press, it is reported that an agreement has been reached between ODT and OPA making it unnecessary to present the Certificate of War Necessity or the unit certificate when applying to the rationing board for a tire for a particular vehicle. A statement of the tire inspection in some form must be made, but that is all that will be required.

Some of the Motor Vehicles Committee in action—Seated: K. Fuery, A. G. A., New York; Linn Edsall, Philadelphia, chairman; E. W. Jahn, Baltimore, vice-chairman. Standing: Jean Y. Ray, Richmond; H. A. Petersen, New York; C. Nicols, Baltimore; S. G. Page, Pittsburgh; and B. D. Connor, Boston

2. Total miles operated—Under this must be reported the total mileage of all vehicles, owned or leased.

*3. & 4. Mileage outbound and inbound—Must be maintained and reported for non-service vehicles only.

5. Mileage for special deliveries and call backs—The utilities should have nothing to report under this item.

6. Mileage under exemptions and permits—No entry should be made under this item, unless requested by the local ODT office. If it is asked for, the figure should be exactly the same as that entered under item No. 2.

7. Total units carried—Required for non-service vehicles only.

*8. & 9. Units carried outbound and inbound—Required for non-service vehicles only.

10. Units per trip—Required for non-service vehicles only.

11. Per cent of capacity—Required for non-service vehicles only.

Local Contact Urged

The committee recommends strongly that each utility establish as friendly relations as possible with the local ODT having jurisdiction over its operation; discuss problems frankly with them and make such detailed changes in records and reports as may be desired by the local ODT management. ODT is staffed as far as possible by practical and experienced transportation men and they will give a sympathetic ear to any special problems presented to them.

The committee recommends that each utility sign the pledge on truck maintenance under the "Keep Them Rolling" plan of the maintenance section of ODT and display decalcomanias on all trucks. It is not necessary after signing this pledge that the detailed inspection procedure as set up by ODT be followed, but it is necessary that a good preventive maintenance system be followed and unless a company now has one in force, it is recommended that the ODT plan be followed.

The committee further recommends that records of operation be maintained on the simplest possible forms which can be devised by each utility to suit its own needs and that the prepared commercial forms should not be used.

Orders 1A and 5C

The committee first feels that it should stress the importance of establishing as friendly contacts as possible with local rationing boards. This is highly important as each board has latitude in its operation and can make things easier or difficult for applicants as it desires.

Passenger tires are registered for use on specific cars, but if it becomes desirable to interchange passenger tires between different cars in the fleet, it can be done by making arrangements through the local board.

It is recommended that insofar as possible, each fleet make its vehicle registration for the entire fleet with one board. This can be done even though the operation may extend over several adjoining counties and is desirable as better relations can be established with the board in this way.

We are restricted to five passenger type tires per vehicle, no matter whether these be used on trucks or passenger cars and must plan our operations accordingly. Local boards have no option in this matter, but again it should be stressed that by establishing friendly relations with local boards, rapid action with certificate applications can be obtained.

Preferred Mileage

Certain utility operations have been declared eligible for preferred mileage. Preferred mileage is, at the present time in the seventeen eastern states, that mileage above 378 miles per month and in the remainder of the country mileage above 470 miles per month. These figures are subject to change from time to time as stocks of fuel increase or decrease. Others have been declared ineligible for preferred mileage. Ineligible operations are meter reading, bill collections, claim investigation or adjusting, cleaning or supervising cleaning work in office buildings.

It is apparent from some of the replies received from various member companies that all local boards have not followed strictly the rationing guide which carries these instructions. It is known, however, to the committee that the intentions of the OPA eligibility directors in Washington are that work of the type mentioned above be eligible for gasoline to the value of a "B" book only and the committee recommends that member companies plan their operations on this basis and do not ask local boards to exceed their authority and grant additional fuel allowances.

The committee recommends that continuous efforts be made to reduce mileages even beyond the point which has been reached at the present time and feel that tire and gasoline rationing restrictions will become tighter before they are looser.

Each fleet can have one or more of its own employees appointed as official tire inspectors, if they have men qualified for this work. Local boards and OPA officers are very willing to allow fleet operators to perform this work for their own vehicles and relieve public inspection stations. It is only necessary to apply to the board having jurisdiction over the fleet, giving them the names of the employees, their qualifications and such other statements as the board may require in order to obtain the appointments.

It is recommended by the committee that the tire inflations and inspections be combined and placed in the hands of competent inspectors and insofar as possible, drivers of cars be relieved of any responsibility for this operation.

It is the recommendation of the committee that all owned passenger vehicles be kept in service or ready for service at all times, if it is necessary to the operation of the utilities to retain these vehicles.

It should be noted that in applying to any local board for gasoline ration for truck or a fleet of trucks, the Certificate of War Necessity must be presented, but in applying for a tire it is optional with the local rationing board as to whether the presentation of this certificate need be made.†

* Recent discussions indicate the elimination of any report of service vehicle under Item No. 1 on the quarterly report and probably the elimination of the necessity for any report under Items No. 3 and 4, 8 and 9, for vehicles in any service whatsoever. Such action is believed to pending final approval.

† See last paragraph in box on page 53.

Dehydrated Foods . . . *Aid War Effort and Offer Promising Market for Gas Fuel*

"The carrots that we're fed each day
Taste just like alfalfa hay.
Hinky dinky—parlez vous."

By H. W. HEISTERKAMP*

The Bryant Heater Co.,
Cleveland, Ohio

H. W. Heisterkamp

THAT pretty well sums up the 1918 doughboy's opinion of dehydrated foods. They were tasteless, mushy and looked like something out of last week's menu.

Small wonder then that many of us look at this new clamor for dehydrated food production as anything but a war baby that will die a natural death soon after the present conflict ends.

But will it? There are a large number of leaders in the food industry who feel that dehydrated foods are here to stay. True, it will not replace or even greatly disturb other forms of food processing, but there is every indication that it will be and remain a major industry in the post-war period, and here are some of the reasons:

1. The industry has learned that earlier attempts were failures from a flavor standpoint because lack of or improper blanching left alive flavor destroying enzymes.

2. New dehydrating technique has resulted in a final product which when rehydrated very closely approaches the appearance, consistency, and flavor of the natural food. Further improvement will come along.

3. There is an inherent economy in the handling of food in dehydrated form from the farmer to the consumer. Spoilage of perishables on storekeepers' shelves is eliminated as is the handling of the large percentage of waste parts; such as peels, cores, etc.

4. Farm labor will be slow in returning in the post-war era, and it is doubtful that it ever will reach the pre-war peak. If such is the case, we must make full use of every pound of produce.

Before enlarging on these points it may be well to discuss briefly the actual process of food dehydration. Control of temperature in the dehydration process is of extreme importance. Because of this and for other reasons with which all of us in the gas industry are familiar, gas becomes the perfect fuel, because all dehydration processes require heat in one form or another.

The principle is not new. We have all come across dehydated food products in our daily lives. Dried fruits are the most common; prunes, raisins, apricots and peaches leading the list. In the beginning such products were dried by exposure to the rays of the sun in open air. A good percentage of the water was evaporated in this way leaving a concentration of the natural sugars in the product which gave these dried fruits their keeping quality. The process was later improved by the application of air and heat in mechanical dehydrators. Vegetable dehydrating is an outgrowth of the earlier application to fruits. As a matter of fact some of the fruit drying equipment has been recently adapted, with minor changes, to the dehydrating of vegetables.

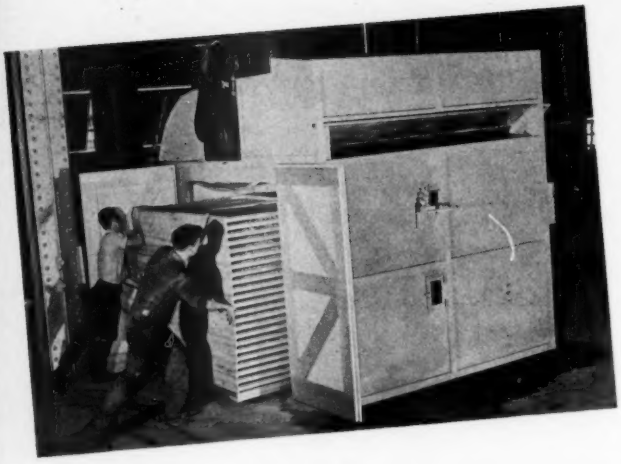
There are four general types of dehydrating units involving different principles, and there are many modifications of each:

1. The "spray type dryer" is capable of handling and drying products which are liquid in their original state. These consist primarily of spray nozzles directing the product into a blast of hot air. The fine mist spray offers a tremendous evaporating surface and the water evaporates into the air stream very rapidly leaving a dried powder. Most of this powder drops into a collecting sump and the rest is carried on with the air stream, later precipitated out through collectors. Milk and eggs are generally dried in this manner.

2. The second type dryer suitable for drying products originally in the liquid

Eight to one! Seven parts of water, by weight, have been removed by drying from the dehydrated vegetables in the foreground. Vegetables in front of the young lady show actual size before drying

* Member, American Gas Association Joint Committee on Summer Air Conditioning.



Two methods of dehydrating fruits and vegetables. At left a stack of trays holding preheated cabbage is run into a cabinet dryer. Above is a tunnel dryer. (U. S. Department of Agriculture photographs by Lee, courtesy of Industry*)*

state but adaptable for heavier liquids and those with some solids in suspension is known as the "drum type dryer." A thin film of the liquid is spread evenly over a heated drum. This dryer is not unlike a printing press. The liquid is evenly spread by a series of rollers similar to the ink rollers on a press with the last roller applying a thin film to the revolving heated drum. The product dries rapidly in a flake form and is scraped off the surface of the drum. Soup, bananas, milk, pectin, etc., are suitable for use in the drum dryer.

3. The "vacuum dryer" is suitable for any liquid or semi-solid product and consists primarily of a covered cooker connected to a vacuum pump. The vacuum serves the purpose of allowing the water to evaporate from the surface at a temperature low enough to prevent cooking of the product.

4. The "tunnel type dryer" is generally used for those foods originally in a solid state and those for which it is desirable to have a final product which will rehydrate to a form similar to the natural food. There are many modifications of this type but in general the food is placed in screened trays through which heated air is blown over and around the product. Moisture is picked up by the air. A continuous exhaust and an equal amount of outside makeup air keeps the moisture content somewhere above the outside air level. Carrots, cabbage, beets, potatoes, fruits, etc., generally are dehydrated in units of this type.

Preparation of foods for dehydration, regardless of type, is similar to that given foods for canning. There are the peeling, coring and cleaning operations and then slicing or chopping of vegetables, placing them in a usable form. Sliced or chopped pieces offer more surface which contributes to rapid dehydration and subsequent rehydration.

However, a most important second step is a blanching or pre-cooking operation in steam or hot water. This is primarily for the purpose of destroying enzymes. The actual dehydration process is carried out at a temperature which does not materially harm these organisms. If left alive a sort of digestive action takes place which alters the flavor and produces a generally unsatisfactory product. Carrots, for example, develop a taste somewhat like straw.

Properly prepared, the foods are then sent to the dehydrator of the proper type. Packaging of course is the final step. Cans, boxes, or cartons may be used depending upon the characteristics of the finished product. Cans, steel, glass or plastic, are generally preferred because they are durable, moisture-proof, vermin proof and easily handled.

Food for Fighting Front

So much for the equipment, what about the product itself. The most important consideration today is their use in feeding the men at the Fighting Fronts and our allies. The big advantage comes in the great reduction in bulk and weight, thus conserving space on cargo ships. Secretary Wickard points out that at the present time 40% of the ocean-going ships supplying our Fighting Fronts are required to carry food. With an average saving in space and weight of about 7 to 1, we can readily appreciate the number of bottoms that would be released for war materials if all the food that could be dehydrated is handled in that manner. It could well be a release of 20% of the ships.

This comparison can be carried further to the field of battle. The maintenance of a supply line is always a prime consideration. A reduction in land transport units is of extreme importance. Consider also that properly dehydrated foods have very good keeping quality without refrigeration. The saving multiplies in the reduction of refrigeration equipment, power equipment and the trained operating personnel. The saving in steel and tinplate through the more efficient use of cans is important but minor by comparison.

Is the product acceptable? Indications are that some of it is very good and other products are just passable. The government at present is purchasing almost the entire supply of dehydrated foods and there has not been much distribution for civilian use. Soups are about the only product which has been given civilian distribution, and the general opinion is that they compare very favorably with the canned variety. In this comparison it is generally felt that some canned products are excellent and others just passable. In many canned foods there is a marked difference in taste and consistency compared with the natural food. Long usage has developed in us a taste for many of these canned varieties. Perhaps the same will be true with dehydrated foods.

It is quite difficult to discuss with any great accuracy the relative merits of the dehydrated foods for, as stated above, there is a lack of direct information. It is reported, for example, that dehydrated orange juice produced here, is finding wide acceptance overseas because of its concentration of

Gas-fired unit which provides a low humidity atmosphere for the storage and packaging of dehydrated bananas and other food products, thus preventing these products from regaining moisture

natural vitamin C. It is claimed to be superior in taste to the natural juice obtained in any place but the home state of the fruit. The reason is that tree-ripened oranges are used and the dehydration process does not alter the flavor. If true, this is a great improvement over the canned variety. The dehydrated product is reported to be in the size and shape of the popular candy mint and the orange juice is prepared by simply dropping the wafer into a glass of water, and in about 20 seconds you have a glass of sparkling orange juice.

There have been several articles written on the use of dehydrated foods for treatment of cases of acute allergy. With dried milk, for example, it is believed that an, as yet, mysterious change in the proteins makes this product an ideal food for babies allergic to milk in other forms. Dried citrus pectin appears to have valuable medicinal properties in addition to its normal commercial use.

These points may be of just academic interest, but they do contribute to the support of the idea that there are many advantages to foods in the dehydrated form and probably more to come, which will lead to their wide acceptance in the post-war period.

Gas Industry's Opportunity

The food dehydration industry has a number of problems and although the processes are relatively simple, these problems are as yet a stumbling block in the development of a product which will meet the high standards which the government has set up and which the peace-time public will demand. It is here that the gas industry can be of great assistance. In many localities, industrial gas men are gaining wide experience in applying heat for actual dehydration and for properly preparing the air in spaces where the dehydrated food is stored and packed.

In addition to the actual drying process there are requirements for the application of heat in preparation of the product in blanching, flame peeling, sterilizing, etc.

To be specific, the aim is to remove as much moisture from the food as possible. The drier it is, the better the keeping qualities, and this is very important, not only in the preservation of the food itself, but the preservation of its flavor and form when re-hydrated. It is important that the food be dried rapidly. This can be accomplished by raising the drying temperature, but the temperature must be held down to prevent cooking, with accompanying loss of flavor and vitamin content.

The more rapid the drying operation, the better the product; the lower the temperature, the better the product. Rapid drying and low temperature require that the air which carries off the moisture must be dry. In the initial stages of drying, the product gives up its moisture very readily but towards the end of the process the travel of moisture inside the cells to the outer surface slows up.

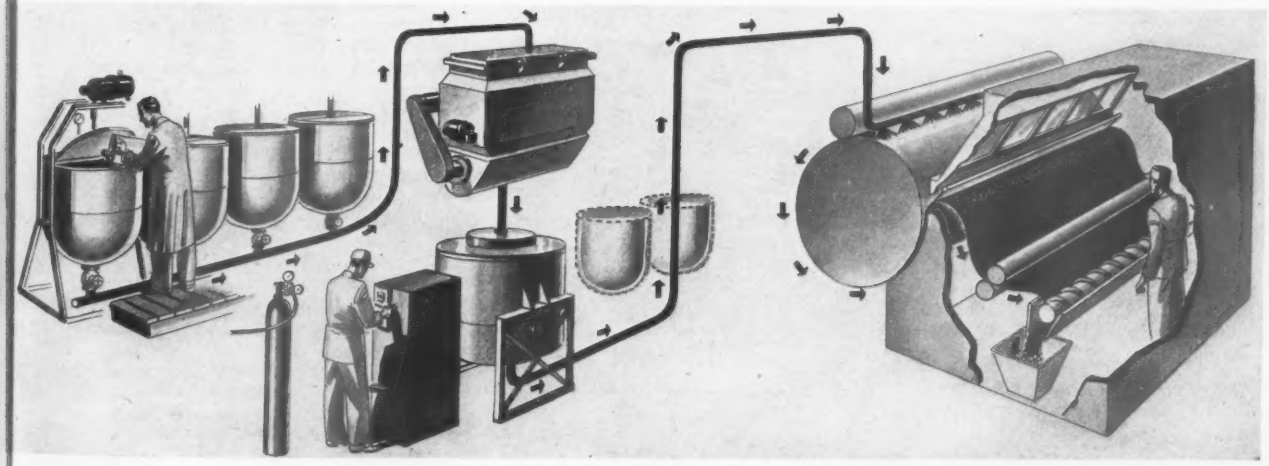
In tunnel type dryers and without the use of air dehumidification the moisture level in the unit and surrounding the product is determined by these factors:

1. The rate of evaporation.
2. The amount of makeup air.
3. The moisture level of outside air.

The moisture level must always be

(Continued on page 84)

Schematic drawing of drum-type dehydrator. Drum heated by steam from gas-fired boiler. Following the arrows around, the drawing shows (1) a group of cookers boiling tomato pulp to sterilize and concentrate it (2) vacuum tank for cooling products (3) pulper which strains skin and seeds from tomato juice (4) mixers for soup ingredients and (5) drum dryer in air-conditioned room to maintain low humidity. (Drawing courtesy of Popular Science)



Post-War Range Buying Urged by Treasury

UNDER the heading "What You Buy With War Bonds," brief newspaper stories with a line drawing of a woman watching a range, appeared in various parts of the country in January signed by the U. S. Treasury Department. Here's the text of one:

"That new cooking range, whether it be gas, electric or otherwise, is something to look forward to when the War is won. But you can start saving now to buy it. Put a definite amount, every payday, ten per cent of your pay check, into War Bonds today.

"When the Bonds mature you will have the money ready for that new range. You will have made a good investment, getting back $4 for every $3. And your purchase of War Bonds is helping that boy, husband or sweetheart on the fighting front."

A Service for Grocers

THE Oklahoma Natural Gas Company can be proud of its new booklet "A Buying Guide" which has been prepared by the home service department under the direction of Mildred Clark, and made available to grocers, home-makers, and members of nutrition committees throughout the state. Grocers are using it to train new salesmen, and one grocer advertises its availability to customers who purchase $2.00 worth of groceries in his store. It has also been used for food shows and for the nutrition lectures at the grocery store consultant booths sponsored by the City Nutrition Committees.

The "Buying Guide" uses the theme "Conserve for Victory" pointing out that food selection plays a particularly important part in good nutrition. Today with the point rationing plan right on the docket, the Oklahoma Natural customers are fortunate to have accurate information on the subjects of meal planning, lunch box suggestions and special pointers on the major food products as selected and purchased.

A second booklet distributed also under the supervision of J. H. Warden, sales manager, "Getting the Most Out of Your Gas Service" is a manual to gas customers including instruction for service of gas appliances, emergency precautions, the reading of the meter, and helpful hints on the use and care of gas appliances.

Single copies of these booklets will be made available by Mr. Warden at Tulsa to gas companies requesting them.

P. C. G. A. Advertising To Continue

THE Pacific Coast Gas Association's co-operative advertising program, maintained continuously since 1929, will be continued through 1943. Instead of "copy" written to increase sales, the advertisements will urge conservation of gas, care of appliances, and will stress the herculean job gas, gas companies, and gas appliances are doing for war production.

Full page space will be used in domestic and dealer publications, but space taken in business papers has been sharply reduced for the duration. The committee in charge of the activity consists of A. C. Joy, Pacific Gas and Electric Company, chairman; F. M. Raymond, San Diego Gas and Electric Company, and D. L. Scott, Southern California Gas Company. The committee has again retained the services of the Knollin Advertising Agency.

New booklets of the Oklahoma Natural Gas Company

Cover of "Bo's'n's Whistle"

Good Lunches Build Liberty Ships

JUST name it and we will build it" is the order of the day at the Kaiser Company shipyards in Portland—the Oregon Shipbuilding Corporation. In the company magazine, the "Bo's'n's Whistle," published bi-weekly for all the employees of the Kaiser Company in Portland, Vancouver and Swan Island, the December 10 issue includes an article on the importance of what a shipyard worker eats.

Set up by Mrs. Rita Calhoun, home service director of the Portland Gas & Coke Company, this article points out how the 60,000 lunch-box meals packed every day for workers at the three shipyards must be nutritious and appetizing to provide the high-test food needed for high-test building jobs. Mrs. Calhoun has included suggestions for good meals and a ship worker's lunch guide,—adaptation of the food rules of the National Nutrition Council.

Defense Housing Projects

Home calls continue in importance in Portland where home calls are being made at the defense housing projects—one a 400-family unit. With many new people moving into that area, the women in the newly equipped kitchens need instruction in their equipment and this is provided through the home call which presents, too, current information on food preparation and uses of western foods. It has been necessary, also, to lay plans for an extensive program of classes relating to home canning.

Mrs. Calhoun reports that Portland has always been a region of home canners but with the many new people this year moving in without bringing their jars for canning and with the supply of jars allotted to dealers on the basis of previous years sales, it adds the special importance of instruction to maintain quality and to make every jar available really count.

Before and After . . . *Test of Utility*

Home Service as a Tangible Asset

By the Market and Economic Research Committee

*Hall M. Henry, Chairman**

DOES Home Service pay? Are the results worth the money spent? Can Home Service activitics be measured? The Market and Economic Research Committee is seeking the answer to these questions and preliminary if not conclusive findings indicate Home Service can be made to pay in direct revenue as well as in the immeasurable intangible benefits which are widely recognized. During *war* or *peace* Home Service results can be made to outweigh the costs. A yardstick can be applied to Home Service activities. Naturally how much is realized from Home Service depends on the methods and directions given to it.

The purpose of this report is to point out case histories of gas companies who have studied and analyzed the results of the activities of their Home Service to ascertain their tangible value in relation to their costs. The reports consists of two parts: first, of results achieved before the war and secondly, results obtained during the war. The case histories will outline briefly the type of work performed by the girls and show the tangible assets measured in terms acceptable to any practical business man.

BEFORE THE WAR

Case Number I

In the summer of 1937, the Worcester Gas Light Company embarked upon a new procedure to exploit the value of their Home Service Department. A small group of girls were specially trained to adjust gas ranges and bake good looking foods in all types of gas ranges, including combination, gas end, and outmoded gas ranges without heat controls to the most modern heat controlled insulated gas range.

A polyglot section of the city was selected where a meter survey showed a large percentage of low use customers and many unused gas services. Each girl, carrying a survey sheet, made house to house calls whether or not gas was used. Special attention was given to unused ovens and dissatisfied customers. On the spot, in the home, demonstrations were made in ovens in which customers complained that everything burned. Complaints were followed up and factual explanations were given to the customer. Call backs were made to see how the oven was baking. To nonusers the possibilities in the home were explained.

Racial Group Activity

After a few months this operation was supplemented by the rental of a store in the neighborhood for group demonstration work. Selected racial groups were invited to the classes sponsored by a leader of their race who acted as interpreter. The whole purpose of this plan was to try to reach this type of customer in a friendly manner through their own racial leader and recipes peculiar to her race and endeavor to induce her to use gas effectively.

A study was made to determine the financial return to the gas company on this activity. Customer consumptions were recorded for three months before the activity and three months after the activity. These consumptions were compared with the gas used for the same period the previous year. The results are illuminating.

1. The analysis of the gas used for three months before the activity compared with the same period the previous year showed a loss of 113 C.F. per customer per month.

2. The gas used by these same customers for three months after the activity compared with the same period the previous year showed a gain of 23 C.F. per customer per month.

3. An analysis was then made of a like number of customers in the same territory who had not been contacted. Records for these consumers three months before the activity compared with the same period the previous year showed a loss of 103 C.F. per month per customer.

4. A comparison of the customers not contacted for three months after the activity with the same period the previous year showed a loss of 60 C.F. per month per customer.

5. To check further, consumption figures were compiled with all Worcester regular domestic consumers. For three months before the activity compared with the same period the previous year they showed a loss of 120 C.F. per month per customer.

6. For three months after the activity compared with the same period the previous year all Worcester regular domestic customers showed a loss of 68 C.F. per month per customer.

7. The significant thing is that in *all cases* for three months before the activity the customers showed approximately the same loss (103 C.F. to 120 C.F.) per month per customer compared with the same period the previous year, while for three months *after the activity* the customers contacted showed a *gain* of 23 C.F. per customer per month compared with the same period the previous year, but all others *not* contacted showed a *loss* of from 60 to 68 C.F. per customer per month. This roughly represents an average increase of 83

* The Market and Economic Research Committee is indebted to Roy E. Wright, of Negea Service Corporation, for his active interest in encouraging many of these Home Service studies and for compiling the data presented herein.

to 91 C.F. per customer per month from this Home Service activity.

Cost studies made by this company on this type of Home Service showed they obtained $1.40 in increased annual revenue for each dollar spent on Home Service.

Case Number II

In 1938, the gas company at Easton, Pennsylvania, increased its sales force so that there was a domestic salesman for each 1200 to 1400 meters and a Home Service girl for each 3000 meters. At the end of the first year, a preliminary survey was made to try to measure the value of the Home Service activity.

Fifty customers in each of the girls' territories, or a total of 250 were selected where Home Service contact had been made but where no new appliances had been installed. Another 50 customers were selected from each of the territories (total 250) who had not been contacted by the Home Service girl and where no appliances had been sold.

Home Service Scores High

A comparison of the two groups of customers was made with the following results: Those customers contacted by the Home Service representative showed a gain of 65 C.F. per month per customer, while those customers not contacted showed a decrease of 60 C.F. per month per customer or an annual gain of $(65 + 60 \times 12) = 1500$ cubic feet per customer contacted.

Two years later a recheck was made of the same customers eliminating those where any changes (such as purchase of new appliances, etc.) had taken place. This analysis showed that they had stayed at approximately the same level as they were when studied two years previous. The comparison was taken on an average for the entire period up to December, 1940. Thus, it appears that there was a net gain of approximately 125 C.F. per month per customer (1500 C.F. per year) where the Home Service girls made a contact.

On the basis of these analyses the Easton company calculated that they obtained $1.37 increase in annual revenue for each dollar spent for Home Service work. Since a check made two years later showed this revenue had continued, we can say, therefore, that this company realized a minimum increase of $2.50 per $1.00 spent in addition to all the intangibles as well as the probability that this revenue will continue.

After the program had been in operation for three years, another attempt was made to evaluate the Home Service activity by comparing the actual load added as shown in the operating report with the estimated load added by the sale of appliances. Consideration was given to new customers added from main extensions, dead services, and those transferred into another rate classification.

Before the intensive Home Service activity the company's "estimated increase in gas usage" would be short of actual increase (as shown in operating report) to the extent of 40% to 50%, indicating that a decrease in consumption by other customers was tending to offset the increases.

After the intensive Home Service program got under way the company's "estimated increase in gas usage" and the actual increase (per operating report) became more in harmony, rising to 82% effective the first year after intensive Home Service work, to 98% effective at the end of three years, when some 80% of all customers had been contacted by Home Service. It is evident that Home Service must not only have arrested the normal tendency to decrease the use of gas but also increased the gas usage or the estimated and actual could not have so closely tallied. This gives another striking indication of the *tangible* value of Home Service.

E. E. Linburg, the manager, stated that 30% of the appliances sold through this three year sales promotional period were from leads turned in by the Home Service Department.

Case Number III

The Elizabethtown Consolidated Gas Company of New Jersey expanded its Home Service Department so that a survey call could be made on all of its customers. Each girl is given a certain number of meters The girls make their survey calls in addition to their regular work, such as follow up new installations, request calls, classes, etc. The survey is made to accomplish three objectives: improve customer relations, promote the sale of gas and gas appliances, and obtain a true picture of the market. Routine survey calls to answer and correct complaints, ream and restore to service baking and broiling burners, provides opportunity to discuss modern cooking methods and suggests the addition of new appliances.

During the period required to make the first survey (26 months) sales from prospects turned in by the Home Service Department amounted to $90,722. A second survey is now in progress. Increased load resulting from these Home Service calls is not available.

DURING THE WAR

At the outbreak of war, the Home Service Department of the New Bedford Gas and Edison Light Company, the Worcester Gas Light Company, and the Dedham and Hyde Park Gas and Electric Light Company prepared a nutrition program in cooperation with the program of the United States Government. The nu-

Case Number IV
NEW BEDFORD, MASS.

		Cu.Ft. of Gas Used Per Average Customer		
	Number Customers	*Month After Course Taken*	*Corresponding Month Year Ago*	*Increase or Decrease*
Group Taking Nutrition Course	100	2553	2273	+260
Group Not Taking Nutrition Course	69	1590	1560	+ 30
		Average Monthly Increase Per Customer or Per Year—2760 Cu.Ft.		230

Note: The above comparison is somewhat subject to question because the group not taking course were smaller use customers (1590 vs. 2553) than those taking course. This study will be further checked.

trition program was taken to the customers of these companies by actual contact by the Home Service representative in the home.

After the program had been in operation for a few months, an analysis was made to determine its effect on building gas load. For this reason, samples of customers in each of these companies who had been given the nutrition story were selected at random. The amount of gas used by these customers before the contact and after the contact was compared with the same period the previous year. A similar size sample of customers in the same neighborhoods who had not been given the nutrition story were also selected at random. The gas consumption of these customers was analyzed in the same manner for the same months. Due consideration was given for any appliance purchases or other similar changes.

SUMMARY

In analyzing the accomplishments of a Home Service Department, great care must be exercised to take into account the many variables that may affect the analysis. These variables may or may not have been properly considered in these case histories.

However, the significant point about these studies lies in the fact that *invariably* there was a larger increase or smaller decrease in the use of gas (where the trend was in this latter direction) among customers contacted than among those not contacted. These studies, while not conclusive, do seem to indicate that Home Service can be evaluated in terms of definite revenue increases and this important activity, in addition to its intangible value, can take its place along side of appliance selling as a proven means of increasing revenues. It will be increasingly difficult during the war to prepare studies on the tangible value of Home Service in building revenues in relation to costs.

However, at the first opportunity it would seem wise for all companies to find out as soon as possible what effect the restrictions of war have upon the use of gas service in the home. In many localities it has been necessary to ask customers to use less gas to aid the war effort and relieve the oil shortage. On the other hand people are confined more to their homes and this fact coupled with the nutrition program the gas industry is promoting at the request of the government, makes for conflicting effects upon domestic gas use and the conservation of fuels.

Case Number V
WORCESTER, MASS.

		Cu.Ft. of Gas Used Per Average Customer		
	Number Customers	*Month After Course Taken*	*Corresponding Month Year Ago*	*Increase or Decrease*
Group Taking Course	94	1628	1675	—47
Group Not Taking Course	99	1456	1556	—100
Average Monthly Improvement Shown by Customers Taking Course Over Those Not Taking Course or Per Year—536 Cu.Ft.				53

Note: These figures were based on a six months' analysis of bills after course compared with same six months a year ago.

Case Number VI
DEDHAM AND HYDE PARK, MASS.

PART I

		Cu.Ft. of Gas Used Per Average Customer		
	Number Customers	*Month After Course Taken*	*Corresponding Month Year Ago*	*Increase or Decrease*
Group Taking Course	100	1472	1240	+232
Group Not Taking Course	100	958	1124	—166
Average Monthly Increase Per Customer Made by Those Taking Course Over Those Not Taking Course or Per Year Per Customer—4776 Cu.Ft.				398

To further pursue the value of this work in Dedham and Hyde Park, the Home Service representative contacted fifty of the customers who had not been contacted in the Part I analysis. Comparisons were then made with the fifty customers not contacted with the following results:

PART II

		Cu.Ft. of Gas Used Per Average Customer		
	Number Customers	*Month After Course Taken*	*Corresponding Month Year Ago*	*Increase or Decrease*
Group Taking Course	50	1088	1044	+44
Group Not Taking Course	50	1148	1176	—28
Average Monthly Increase Per Customer Made by Those Taking Course Over Those Not Taking Course or Per Year Per Customer—864 Cu.Ft.				72

Please note that before these customers were contacted they showed a loss over the corresponding month last year, while after they were contacted the same comparison showed a gain.

SUMMARY

	Difference in Gas Usage Made by Customers Contacted Over Those Not Contacted		*Revenue Added Per Dollar Expense*
	Cu.Ft. Mon. Inc.	*Cu.Ft. Yearly Rate of Inc.*	*Home Service*
Before War Activities			
Case I	93	1116	$1.40
Case II	125	1500	1.37
During War Activities			
Case IV	230	2760	Not
Case V	53	636	Available
Case VI—Part I	398	4776	
Case VI—Part II	72	864	

With Our A.G.A. Laboratories' Men in the Armed Forces

By R. M. CONNER

Director, American Gas Association Testing Laboratories

Ensign and Mrs. F. J. Pryatel

Lt. Oscar N. Simmons

Capt. T. S. Leitch

Aviation Cadet and Mrs. F. W. Johnston

A TOTAL of 25 former staff members of the American Gas Association Testing Laboratories are now among our Armed Forces scattered throughout the world. While this number seems infinitesimal in comparison with the four million or more now constituting our country's fighting strength, it nevertheless represents about 40 per cent of our present Laboratories' personnel and shows the extent to which our former staff members are now participating in this world-wide war.

Many of these men had been associated with us for several years and received specialized training which in the normal course of events would have fitted them for engineering or managerial responsibility within our own industry. At present, this is being devoted to our country's service. A deep pride has always been taken by our Laboratories in the character and ability of its staff. The contribution which such a substantial number of our former employees are now making in the present emergency intensifies this feeling in which it is believed our combined industry shares.

Since Pearl Harbor, some of our former engineers have been sent to all parts of the world. At the present time three are in Great Britain, two in Africa and one among the South Pacific islands. The remainder, with the exception of a few known to be in basic and advanced training centers in this country, have A.P.O. numbers indicating that they are in active service. The entire number is almost evenly divided between the Army and the Navy. Seventeen are already commissioned officers and their number is constantly growing.

Instructors at Annapolis

Two of the first engineers to leave the Laboratories in response to calls to active duty were Lts. J. B. Heinicke and R. B. Kleinhans, both of whom are stationed at the Naval Academy at Annapolis as instructors in chemistry, physics and electrical engineering. Other Laboratories' employees who later entered the Navy have already appeared in their classes. Before joining our staff, Lt. Heinicke was employed by the Consolidated Gas Electric Light and Power Company of Baltimore. As a Naval Academy instructor he is now conducting a demonstration and lecture course on Fuels and Combustion. Lt. Kleinhans prior to entering the Laboratories employ was an Assistant Professor in Athens, Greece and also traveled extensively.

Captain B. A. McCandless was the first Army Reserve Officer to be

Lt. R. T. Hlavin

Lt. F. E. Hodgdon

Ensign Walter J. Gay

called for duty from our staff. As a member of the Field Artillery Board at Fort Bragg, North Carolina, he is now in charge of inspection and testing of artillery equipment submitted to the Army at that center. His previous experience as a test engineer and inspector at our Cleveland Laboratories provided a valuable background of training for his present responsibility. His many acquaintances among gas appliance manufacturers over the United States will be interested in knowing that he is second in command at Fort Bragg.

For a short time Captain T. S. Leitch, another Reserve Officer, was also stationed at Fort Bragg. His latest address is Camp Wood, Belmont, Texas, where he is now directing training in tactical maneuvers in a tank destroyer division of the field artillery. Gas appliance manufacturers will recall him as in charge of our Laboratories' central heating and water heater testing sections.

In North Africa

Actually on the fighting front in North Africa are Lts. J. D. Martin and C. G. Allen. Lt. Martin is Engineering Officer of an Amphibious Command division; in more popular terminology, he might be called a Ranger or Commando. The limited information available indicates he assisted in landing our forces during the momentous opening of the second front. News from Lt. Allen has been carefully confined to brief notes on crude barter practices employed by the North African natives. We do know, however, that he is with the Signal Corps of the Army Air Force now actively engaged. These two Lieutenants formerly worked side by side in our range testing section at Cleveland.

Notice was received early in January of the graduation of Lt. R. T. Hlavin as a member of the first class trained as officers in the South Pacific Area. While he received his Lieutenant rating on October 1, 1942, it was only recently that the news reached us. As he is attached to the 37th Division which has been reported in action, it may be assumed that his knowledge as an officer was immediately tested.

Three in Great Britain

At the present writing we know definitely that three of our former engineers are now located in Great Britain. These include Lts. D. F. Leverett and F. E. Hodgdon and Pvt. D. G. Willich. Lt. Leverett, according to latest reports, is in charge of an electronics group in the Signal Corps somewhere in Scotland. Lt. Hodgdon was one of the last Reserve Officers on our staff to be called to duty. At that time he was a member of our newly organized War Products Department. His recent communications have indicated the value of his former work in meeting problems with which he is now faced. Our latest word from Pvt. Willich is that he is engaged as a construction engineer on the British Isles. Knowing his ability and capacity for work, his early promotion is confidently anticipated.

It has been exceedingly difficult for the most part to maintain contact with many of our engineers now in the Navy, particularly those aboard ship. For example, Ensign Walter J. Gay of the chemical warfare division participated in the North African landing, and has since been stationed on the eastern seaboard. Less information is available regarding Ensign H. C. Clark, Engineer Officer on a destroyer who has likewise seen action. Ensign F. J. Pryatel has been sent from one training center to another, indicating that he is being groomed for a position of higher responsibility. He was first stationed in Philadelphia where he specialized in instrumentation. At present he is in Washington, D. C. where he is receiving additional training in metallurgy relating to nautical warfare.

Not all our men in the armed services are from our Cleveland Laboratories. Considering the relative size of our Pacific Coast Branch staff, it is more than amply represented. Lt. Oscar N. Simmons, located in Washington, D. C. with the Navy Ordnance Department, is now expecting an assignment to active duty. As one of the older employees of our West Coast Laboratories, he is widely known to the gas industry in that area. Lt. T. E. Othman who reported for army duty from the Pacific Coast Branch was first assigned to camouflage training on the West Coast. He was next given advanced motor transport training at Camp Holabird, Md., and then ordered to a camp in Arizona. His present whereabouts are unknown. No information is available on the activities and location of Lt. J. J. Kavanaugh, who recently received his commission at Fort Sill, Oklahoma.

At Training Centers

Among other former employees, now at various training centers in the United States, may be included Lt. C. F. Geltz who is at present receiving advanced training in the motor transport school at Holabird, Md. Likewise, aviation Cadet F. W. Johnston is receiving special training in meteorology for the Army Air Forces at Chicago, Illinois. Rapid promotion has been awarded to Lt. H. L. McPherson. After completing a special course in electronics at Case School of Applied Science in Cleveland, he was then sent to Fort Monmouth, New Jersey. He is now located at Camp Murphy, Fla., where, as a member of the Signal Corps, he is now company commander of two platoons.

With the exception of Corporal C. B. McIntosh, who was one of the first of our engineers to enlist, the others on our Honor Roll consist of more recent employees. Unfortunately, Corporal McIntosh was put on the sick roll shortly after his basic training period was completed and has been hospitalized for the past 15 months. Corporal N. F. Schulz is handling supplies at Camp Sibert, Ala. The remaining three men on

our Honor Roll, shown in the accompanying illustration, have also received promotions. A. J. Klika is a Technician 5th Class in the Army Air Force, while G. A. Duncan and H. A. Taylor have attained ranks of Seamen, Second Class. The 25th and latest member of our staff to join the Armed Forces, J. A. Shell, does not appear on the Honor Roll.

Resignation of so many experienced engineers within a relatively short space of time has, under present conditions, naturally brought about a major personnel problem. This has been further intensified by our Laboratories' entrance into direct war work. From a modest beginning less than a year ago such activities have steadily increased until they now represent more than two-thirds of our operations. All indications point to their further growth. Before final victory is attained, it is fully expected that our facilities will be devoted almost entirely to various phases of the war effort. Much that has already been accomplished cannot be discussed at this time for obvious reasons. However, it may be stated that the ability of our Laboratories to solve research and development problems of an urgent nature for both the Army and Navy has already been fully demonstrated. In this way it appears that special facilities can most effectively contribute to ultimate victory.

Servel Praised for War Effort at Army-Navy Award Ceremony

HIGH praise for the management and workers of Servel, Inc. in the manufacture of war equipment was voiced by prominent army and navy officers participating in the Army-Navy "E" Production Award which was officially presented to the Servel organization at Evansville, Indiana, on January 15.

The ceremonies were held in the company's huge new war production building and witnessed by a capacity audience of more than 10,000 persons, including employees, speakers and special guests. Dedication of the new building, which adds 235,000 square feet of floor space to the Servel plant, took place at the same time.

Presentation of the Army-Navy "E" pennant for excellence in the production of war equipment was made by Col. Fred A. McMahon, chief of the Cincinnati Ordnance District, Cincinnati, Ohio, who said:

"You men and women of Servel have done a magnificent job at your desks, at your benches, with your brains and your hands.

"For some time word has passed around, through military channels, and throughout the industrial field, of your achievements, about your cartridge cases, your airplane wings, your gun breeches, your cylinder heads and your fire units. We've heard a great deal about the excellent engineering skill and remarkable productive ability of the employees and management of Servel."

In accepting the award, Louis Ruthenburg, president of Servel, Inc., said he spoke for the men and women who work at the machines and benches, supervision, management, and directors who were impressed anew with a deep sense of responsibility in the war program.

"The wartime policy of American industry is to contribute its utmost toward winning the war as quickly as possible," he declared. "Servel wholeheartedly subscribes to, and is motivated by, that policy."

A surprise guest speaker on the program was Lieut. Louis A. Schauer, United States Army Air Force. As a member of a Flying Fortress bomber crew, Lieut. Schauer has participated in nearly every major engagement in the South Pacific since the war began and was decorated for his part in the battle of Midway.

In a short talk, Lieut. Schauer said that he formerly was a salesman of Servel refrigerators for the Milwaukee Gas Light Company and was very happy to be present at the ceremonies.

Coveted Army-Navy Production Award pennant is accepted for Servel, Inc. by Louis Ruthenburg, president. Holding the flag are, left to right: Geo. S. Jones, Jr., vice-president; two women employees; and August Horstman, president, Servel Employee's Association

Gas Conservation Program Gains Support

THE American Gas Association's gas conservation and curtailment program issued to all gas companies November 23 has met with a gratifying response. One hundred and twenty companies have ordered 2,700 mats of newspaper ads for use in the local press. The three pamphlets included in the conservation material also have been generously used, more than 250,000 copies of which have been ordered by gas companies. Prior to its distribution to the industry, all of the above material received the approval of the Power Division of the War Production Board.

The substantial amount of A. G. A. conservation material ordered is no accurate measure, however, of the total volume of gas conservation advertising placed locally by the various operating units of the industry. The A. G. A. MONTHLY for December and January shows typical ads on gas conservation published by some representative companies. In addition, 91 companies have ordered 1,070 newspaper mats reproducing the gas industry's national ads, all of which make extensive mention of the need of gas conservation in the home.

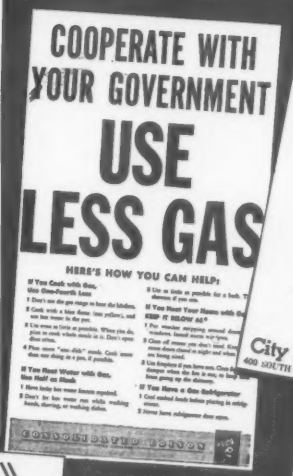
Post-War Appliance Group Formed

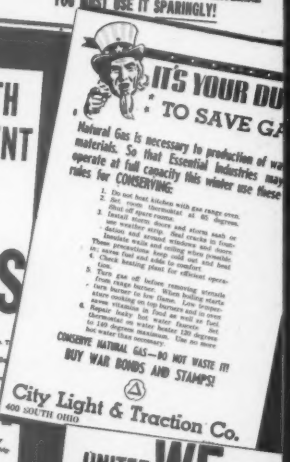
IN a step looking toward the improvement of post-war gas appliances for all purposes, the Pacific Coast Gas Association has announced the appointment of a Committee on Post-War Appliances headed by W. M. Jacobs, Southern California Gas Company, Los Angeles.

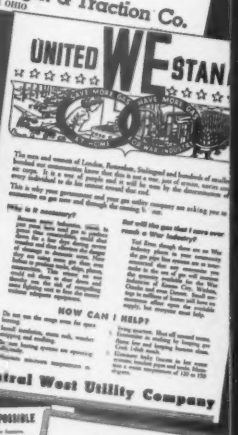
Utility representatives on the committee are F. U. Naylor, Pacific Gas and Electric Co.; and D. E. Farmer, Portland Gas and Coke Company. Manufacturer representatives are: W. M. Couzens, Gaffers & Sattler; Klaas Eisinga, Continental Water Heater Co.; C. A. Miller, Servel, Inc.; J. E. O'Hagan, Grayson Heat Control; and Clyde Watts, Payne Furnace and Supply Company.

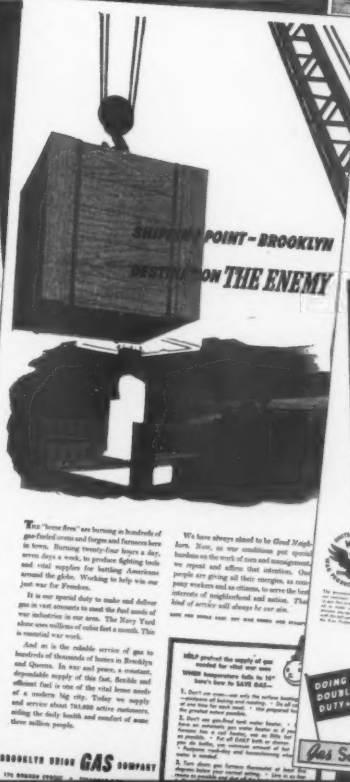
GAS CONSERVATION ADVERTISING

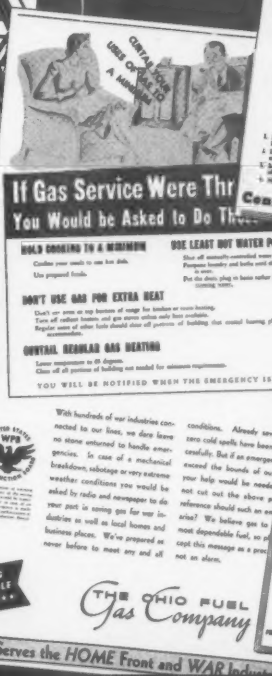
A SUBSTANTIAL volume of newspaper advertising currently used by gas companies emphasizes the subject of gas conservation. The Power Division of the War Production Board has expressed a desire to see copies of all conservation advertising done by gas companies. A second series of gas conservation ads has been prepared by the Association's Publicity & Advertising Committee at the request of the Committee on War Activities. This new series is for the use of manufactured gas companies and stresses the need of saving gas to conserve oil for vital war needs. Sample copies are available from Association Headquarters.

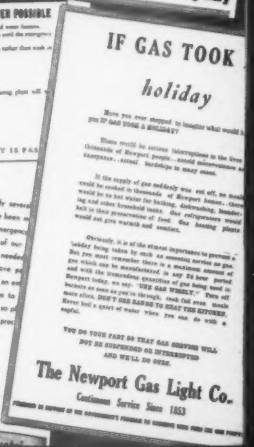


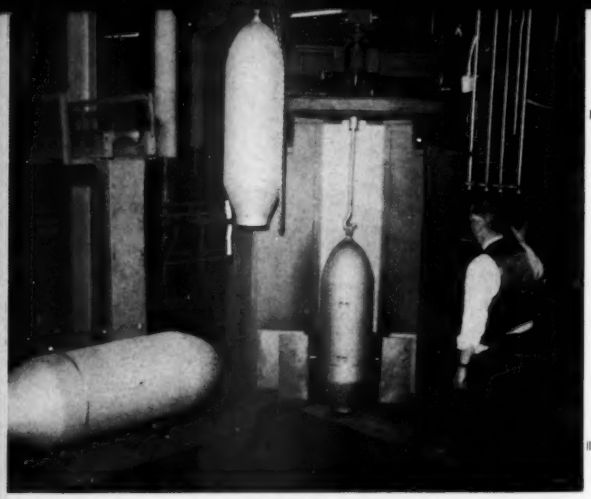












Bombs leaving conveyor system and entering gas-fired furnace for heat treatment

Stoves to Bombs . . .

*Gas Range Manufacturer Converts to War Work**

IN shifting from civilian to war production, necessary changes are often so radical as to appear impossible to the conventional manufacturer who hesitates to venture far afield from his usual peacetime operations. However, manufacturers can and are meeting the changing problems of today and of the future, and are doing the task in the American way. Each one finds his strength in his own initiative and individuality.

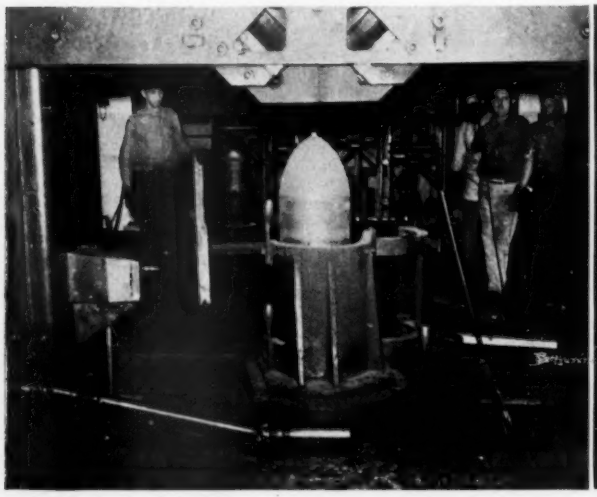
Among the firms meeting the challenging conditions prevalent in converting to war production is the Wrought Iron Range Co., St. Louis, Mo., members of the American Gas Association and manufacturers of hotel, restaurant and domestic gas stoves. It has drawn on its experiences of the past, on its own imagination for ideas to meet the various conditions in which the plant was placed after December 7, 1941. And, those ideas were implemented into results that bespeak action—action such as is required today.

On January 6, 1942, F. F. Daugherty, St. Louis Ordnance District engineer made his first survey of the Wrought Iron Range plant, checking all machines and equipment that could be used for some form of war production. What could be produced in the plant was a conjecture because, according to Mr. Daugherty, plants doing sheet metal fabrication are not equipped to produce major ordnance items. However, B. B. Culver, Sr., president of the firm, wanted to go into war work—regardless of what it was, and conversion costs were not to stand in the way. The Ordnance District was given the "go ahead" signal and Wrought Iron kept in step.

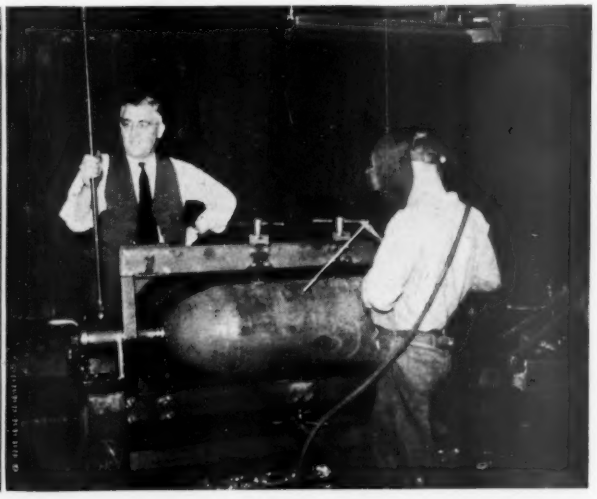
The interest shown in this plant was due to its eagerness and known ability to produce—it possessed management and engineering talents of high caliber; it had a high financial rating; and its machines reached a very high productivity percentage. However, it was obvious that the problem of turning the plant into an arsenal for war should not and could not be the sole responsibility of our Government. This immediately challenged the plant's knowledge and skill.

Most manufacturers consider the Ordnance District their "wet nurse"

* Reprinted by special permission from *Ceramic Industry* of December, 1942.



The bomb nose is formed first. Dies set at 45° angles come down against the pipe, forming the steel and properly shaping it. It is then returned to the forging furnace



After forging, bombs are hoisted on a conveyor and sent to the lug welder who welds on handling lugs. Shown here is E. W. Nagle, plant superintendent

when converting over to war production. However, this organization was not nursed. While Mr. Daugherty was working toward a solution, the plant's management visited and consulted with other plants already in production to learn how their own operations could be converted quickly and rapidly. Subcontract work was investigated, but it was learned that only job work was available—job work entailing assembly operations. Weeks were spent studying plant blue prints of equipment, space, etc.

The desire was to produce some war material that could be manufactured and assembled on a production basis and be an ordnance material that was always in need by the armed forces. Of the major equipment used for making stoves, the punch presses were given first consideration. How could they be used? What could they produce? Could they be used to manufacture a precision war item—of such precision that it would function perfectly when placed in the hands of the Army?

In the matter of precision, the Ordnance District is considered hardboiled when it demands that ordnance materials contain no duds, but it contends that a soldier is better off without a gun in the face of an enemy than to have a defective one on which he depends. Such cold facts require precision work. Here was a plant anxious to do such work—cost notwithstanding.

Several weeks of survey work were consumed, but nothing transpired. Finally, Mr. Daugherty phoned Mr. Culver and said "You're going to make bombs!" Mr. Culver replied, "Bombs? Why we don't know a thing about them, but if you say we can make them, we'll make them."

One of four size bombs was considered for production, and its production depended on one important factor—machines. What machines other than presses could be used? The enamel furnace could be used for heat treating and normalizing, the enamel spray equipment could be used for painting the bombs, and the stove conveyor system could be rebuilt. That was all. The rest would have to be built or purchased and installed.

The management went ahead at its own expense. After careful study of the existing stove presses, it was learned that their 18 strokes per minute operation could not meet the 130-175 stroke per minute requirement of a bomb-forming press. Hence, the 500-ton horizontally fed punch press was redesigned to employ the principle formerly used in stove manufacture; but it was found that horizontal feeding of steel tubing into the press for bomb nose and tail forming dropped scale into the dies. Also, terrific pressure build up at the nose and broke the complete cam fixture. A solution was to change to vertical forming, using dies that came down at a 45° angle.

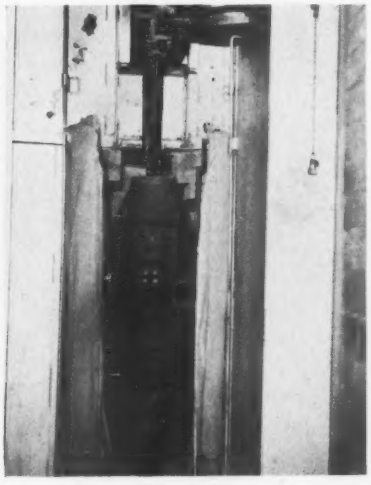
A bid was placed with the Ordnance District and a contract for bombs was awarded to the plant. Of the complete bomb, 25% is subcontracted and these component parts are returned to the plant where complete assembly is made.

A monorail system was built leading from the yards to the cutting room where the "bomb" pipe is cut to correct lengths. Forging furnaces handle vertically the heating of the pipe prior to delivery to the tail-forming and nose-forming presses. The nose is formed first, followed by the tail forming. Almost double time is required to form the nose.

A roller conveyor is used to carry the bombs to the welder who puts on the handling lugs. After all lugs are tested for strength, an overhead conveyor carries the fabricated bomb to the annealing furnace. The original 12 burner enamel furnace was partitioned lengthwise down the middle and 30 additional gas burners were installed on one side down its entire length. The 36 burners on the one side do the annealing work. The six burners on the return side handle the normalizing operation, from whence the bombs exit through a specially built door, bringing them out into the open where air normalizing completes the job.

Both nose and tail are then machined in converted axle lathes and

Bombs are sent the entire length of the one side of the partitioned-off gas furnace, and return on the opposite side, past six burners where normalizing begins



A door was cut into the side of the gas furnace. The movement of the bomb opens the door, bringing the bomb into the open air for complete normalizing

B. B. Culver, Jr., vice-president of Wrought Iron Range Co., inspects two bombs. The nose ring on a bomb is removed before loading

immediately topped in renovated drill presses.

After a thorough steel grit blasting to remove all dirt and scale, the bombs are sprayed with a non-reflecting olive drab paint in the original stove enamel spray booths. The spray booths were redesigned to enable conveying through the sides of the booths. Bombs are turned on a star wheel mechanism to facilitate painting on their entire surface. A goose neck spray paints the inside of the bombs. The bombs are then assembled completely with the subcontracted component parts and are ready for ordnance inspection and shipment to loading depots.

New equipment required to fulfill the contract include the overhead and table roller conveyor system, the pipe cutting machine, all forging furnaces, special presses, machining equipment, lug testing equipment, gas burners, a steel grit blasting machine and sprayer nozzles.

This is a big order, but not too big for a firm whose initiative, perserverance and ardent desire to aid the war effort predominated from the very first when it became apparent that the plant should and must be converted as a whole.

Two factors are significant in this success story: (1) The patience that perfected the tools that could forge, form and anneal and give tensile strength to projectiles; (2) The candor with which this company realized the inadequacy of the machines that once were used to make stoves, and supplanted those machines with the kind that could do the more difficult job of bomb production.

Time, money, ingenuity and engineering ability were put into a common melting pot from which are emerging ordnance materials essential to a war prosecution of the highest order. Thus is exemplified the effort of one of America's leading gas stove manufacturers.

Report on Post-War Plans Cites Importance of Better Appliances

AS an integral part of its war efforts The Brooklyn Union Gas Company is giving serious study to post-war planning. Numerous studies are in progress which aim at putting Brooklyn Union in a position to make a maximum contribution to the peace which ultimately will be won.

One phase of the company's planning is covered in a preliminary report on "Post-War Appliance Development." As its title implies, it deals with ways in which appliances can be improved and offers specific suggestions as to how the improvements can be achieved.

The company is presenting the report at this time with a view to stimulating further study by other leaders in the gas industry and by appliance manufacturers. It is offered as a "progress report" only, since technological progress in the course of the war doubtless will make possible still greater advances and since no one can foretell exactly what conditions will prevail at the end of the war.

However, the report is extremely interesting for the emphasis it places upon the importance of having an improved line of appliances ready to offer the public—appliances which will give better service, cost less, be still more economical to operate, and be as nearly automatic, foolproof and safe as it is possible to make them.

The suggestions offered and the conclusions drawn represent the fruits of extensive study by numerous individuals, both in and out of the company. Customers have been interviewed, service men consulted, and the advice and recommendations of experts in numerous fields obtained.

The report is divided into two parts, the first of which discusses proposals having to do with the improvement of appliances. It will be of especial interest to manufacturers. The second section deals with other development projects on which this company has been working.

The first part is scheduled to appear in the January 28 issue of *Gas Age*. The full report is being submitted to trade publication editors.

Hugh H. Cuthrell, vice-president of Brooklyn Union, is making a personal tour of appliance manufacturers to obtain their views and enlist their cooperation in planning now for the post-war period.

100th Anniversary of Lovekin

THE Lovekin Water Heater Company of Philadelphia recently celebrated its 100th anniversary of active and progressive service to the gas industry and its customers. This firm's century of accomplishment in the gas equipment manufacturing field brought many expressions of congratulations and good wishes for its notable contributions. John Scott Fowler 3rd is president of Lovekin.

New Series of Gas Conservation Ads

AT about the same time this issue of the MONTHLY reaches subscribers, the American Gas Association hopes to have a new series of gas conservation advertisements in the possession of all companies using oil. The ads are being prepared by the Association's Publicity & Advertising Committee in cooperation with the Committee on War Activities, in line with the suggestion of the power division of the War Production Board that all manufactured gas utilities join promptly in a conservation campaign to save vital fuel oil.

This new campaign will emphasize the need of saving gas to conserve oil and will consist of some 6 to 10 newspaper advertisements in two- and three-column size available from Association Headquarters in mat form. This will be the second series of conservation ads to be issued by the Association within recent months. The first series was issued last December 1 and approximately 120 gas companies have published the ads in their local press and have purchased a large quantity of pamphlets for distribution to customers.

Appointed to National Advertising Committee

J. J. Quinn

GAS companies in the six New England states participating in the gas industry's national advertising program have selected J. J. Quinn, general sales manager, Boston Consolidated Gas Company, Boston, Mass., to represent them on the Committee on National Advertising. The New England companies have been without a representative on the committee since the death of Mr. Cadwallader on November 29, 1942. On various occasions when it was impossible for Mr. Cadwallader to attend meetings of the Committee Mr. Quinn substituted for him, and is therefore familiar with the advertising program as it has developed over the last year or so.

H. Carl Wolf, chairman of the Committee on National Advertising, has announced the appointment of W. M. Jacobs, general superintendent of sales, Southern California Gas Company, Los Angeles, as chairman of the Subcommitee on Approval of Domestic Gas Copy. Chairman Wolf also has appointed Mr. Quinn to the same committee.

RETORT

"The day of retort houses is over; what is wanted is complete gasification."—GEORGE HELPS in *Gas Times*, London

Safety Trends

Contributed by the Accident Prevention Committee

Edited by W. T. Rogers, Ebasco Services Inc., New York, N. Y.

WE ARE ENGAGED IN TWO WARS

THERE has just been made public the total number of our war casualties since Pearl Harbor. These casualties embracing killed, wounded, missing and prisoners aggregate some 61,000 persons.

During this same period 46,500 American workers were killed; 19,000 on the job, 27,500 off the job. In addition, 165,000 workmen were permanently disabled.

The business of real War is to kill and maim. This is the business of the military. Our business, on the home front, is to prevent accidents which result in killing and maiming. How are we conducting our business, that is, our war against preventable accidents? The record speaks for itself.

In peace-time an injury record such as that cited above would be a national disgrace, now it is a national calamity. Aside from humanitarian considerations which prompt the preservation of life and limb, there is the added consideration of loss in man-hours resulting from accidents.

We cannot afford to waste the potential services of any man (or woman either) who is of working age.

Accidents are not inevitable nor unavoidable; they don't just happen. They are the natural results of natural causes and the causes must be removed. In this way, and in this way only, our private war against accidents will be won.

BRING 'EM BACK ALIVE!

J. B. HARRIS, safety director, Arkansas Louisiana Gas Company, Shreveport, Louisiana, contributes the following thought in furtherance of the campaign to reduce away-from-the-job injuries. Says Mr. Harris: "Industrial safety for the past twenty-five years has been geared to a program of protecting the employee before the whistle blows. The shortage of skilled labor due to World War II has convinced all far-sighted industrial executives that 'round-the-clock safety is now necessary in order to conserve their present supply of manpower.

"Although most safety programs were inaugurated to effect savings in workmen's compensation and medical costs, only a brief analysis is necessary to show that far greater savings can be effected by the administration of a well-rounded safety program. As a matter of fact, it is now definitely proved that direct costs of industrial injuries amount to only 20% of the total costs.

"But let's carry this a step further. Manpower is short and getting shorter. Women, old men, young men, the physically unfit and others are now being employed to keep operating for the duration. All our employees are precious and difficult to replace; therefore, measures of conservation are not only prudent but necessary in order to prevent our production curve from dropping.

"Moreover, our national war effort calls for an enlarged accident prevention program. Let's look at some figures: During 1941 some four million American workers were disabled by accidents; of this number two and one-half million were injured away from the job. Thirty-two thousand workers were killed by accidents while at home, or going to and from work. What a tremendous loss to our war production program! This lost time could have been converted to the production of 14,000 heavy bombers, or 70,000 fighter planes.

"At first blush, the inauguration of an off-the-job accident program may smack of paternalism to some employers. Yet it can be administered on a basis that will enlist the hearty cooperation of employees. Once shown the necessity for such a program, the average employee will have no difficulty in seeing that he will be the principal beneficiary.

"The National Safety Council is now in the process of preparing material for distribution to employees of interested companies which will be helpful in bringing the facts to the employee. Management and safety engineers will then cooperate in showing the employees that the same measures used in industrial accident prevention can be carried into the home and off the job. Employees will learn that determining the cause and applying the cure will prevent accidents in the living room as well as on the pipeline.

"Briefly, here are the benefits to be derived from such a program:

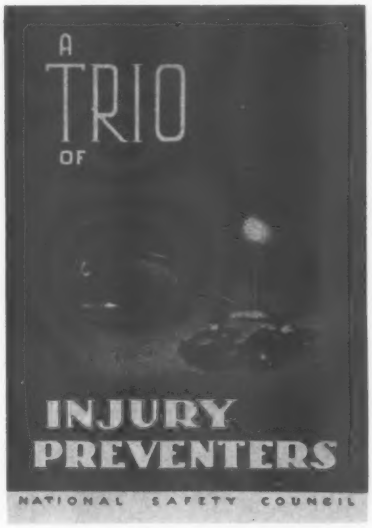
1. Increased efficiency, decreased absenteeism.
2. Improved morale.
3. Improved employee relations.
4. Decrease in overhead.

"The gas industry has long been one of the nation's leaders in prevention of accidental injuries on the job. The accident frequency rate for the industry has been reduced from 30.5 for 1929 to 13.6 for 1941. This fact shows that we have sold our employees on the necessity of on-the-job safety. By administering a well-rounded, intelligently planned program, our employees will become as safety-minded off-the-job and go round the clock in safety.

"Let's bring 'em back alive!"

Look Ahead, Plan Ahead
Keep Your Head
and
You'll Be Ahead

SAFETY POSTERS



P. A. ALBERTY, chairman of the Poster Committee, suggests the National Safety Council poster reproduced herein as particularly adaptable to gas companies. The poster showing safety shoes, safety hat and goggles as "A Trio of Injury Preventers" should be effective in the continuing educational campaign to get workmen to wear these articles as required.

SAFETY DRIVE IN WAR PLANT CITIES UNDER WAY

WILLIAM A. IRVIN, national chairman of the War Production Fund to Conserve Manpower, Colonel John Stilwell, president of the National Safety Council, and other leaders in the National Safety Council started their tour of war plant cities on January 17. They will meet with business, industrial, union and municipal leaders to enlist them in the national safety movement. Each city will be offered the full aid of the National Safety Council in curbing its accident toll.

With local leadership, fund financing and

National Safety Council guidance, an immediate attack will be made on the industrial, home, school and public accident situation in each community. Their itinerary is as follows:

St. Louis	January	18-20
Chicago		21-25
St. Paul		26
Minneapolis		27
Seattle	February	1
Portland		2
San Francisco		3-5
Los Angeles		8-9
San Diego		10
Dallas		16
Ft. Worth		17
Houston		18
New Orleans		20-23

One other city to be designated later.

War Record Cited

IN a printed booklet published December 7, 1942, entitled "The War and Our Company," the Cincinnati Gas & Electric Company presents an interesting account of its record and accomplishments during the first war year. After pointing out the pre-war planning that made gas and electric power controlling factors in war production, the booklet lists the company's roll of honor, the air raid defense participation of its employees, the scrap salvage program, War Bond sales, and many news items showing the extent and character of the company's contributions to the war effort. H. C. Blackwell is president of the Cincinnati utility.

Experimental Pressure Cut Proves Success

REDUCTION of gas pressures was proven a feasible method of reducing send-out during periods of gas shortage by a pioneering "low-pressure test" held in Fullerton, California, on January 7, a report by H. W. Geyer, utilization engineer of the Southern Counties Gas Company disclosed in January.

Results of the test disclosed that only six per cent of the consumers in the area affected experienced range trouble during the drop in pressure from eight inches to four inches of water column, and only one per cent experienced water heater difficulties. Pressure reduction will therefore be adopted as part of the company's wartime emergency program.

Preliminary experimental studies which had been made on various types of appliances had indicated that appliances adjusted to operate at eight inches pressure could operate on four-inch pressures without introducing hazardous conditions. The field tests were conducted according to these experimental findings.

The low-pressure test also provided the first real emergency in which the company's new radio communication system was brought into full operation. Radio sets were spotted at the three terminal low-pressure points in the system, and also at the three points of "send-out." The directors of the test were kept in instantaneous contact with these six vital points.

From the terminal points, operators kept the directors informed as to the drop in pressure; the directors in turn gave necessary directions to the distribution stations who regulated the pressure accordingly.

"The radio transmitters proved invaluable during the test in maintaining instant communication and control," Mr. Geyer declared.

Gas Curtailment

LIMITATION Order L-174, which curtails the consumption of manufactured gas, was amended January 1 to provide that deliveries of gas may be curtailed to any consumer having standby facilities who fails to secure an adequate supply of fuel for such standby facilities despite the availability of such fuel.

The order was further amended to provide that, if a gas shortage threatens, any domestic consumer using gas for space heating can be required to convert to equipment using a less critical fuel.

Use of Tin in Gas Meters Restricted

WAR Production Board Preference Order M-43-b (Part 1001.3) restricts the use of tin in certain gas meters. After February 15, 1943, notwithstanding the provisions of any state statute or governmental regulation, no person shall use tin-bearing solder or other tin-bearing material in the adjustment, internal repair, or resealing of any tin-cased gas meter having a rated capacity of less than 300 cu.ft. per hour except:

(1) A meter which is found not to be accurate within an accuracy range of plus or minus 4% when tested by standard meter prover tests; or

(2) A meter which has not been previously repaired internally for twelve years or more.

The restrictions do not apply to any such gas meter which was withdrawn prior to January 26, 1943, for the purpose of testing and returning it to service.

New England Gas Annual Meeting

THE annual meeting of the New England Gas Association will be held at the Hotel Statler, Boston, Mass., on Thursday, March 18. The Directors' Dinner will take place the evening of March 17.

Two business sessions will be held on Thursday at which outstanding speakers will discuss pertinent phases of the war effort.

Gas Plant to Produce Butadiene

SATISFACTORY progress in the construction of facilities for the manufacture of butadiene by Southern California Gas Company has been reported by H. L. Masser, executive vice-president. The program, under which one of the company's gas manufacturing plants will be utilized to produce one of the two essential ingredients of synthetic rubber, was begun last summer in cooperation with the Rubber Reserve company, a government agency created to promote rubber production.

Under the program, the gas company is having an extraction plant built by C. F. Braun Company for the purpose of taking high pressure gas from the outlet of the company's compressor plant and producing crude butadiene from the gas. The gas company itself is building additions to its existing boiler plant and gas generating facilities under an agreement with the Defense Plant Corporation.

Since a very considerable amount of existing gas plant equipment required in the butadiene process—such as gas generators, boilers, compressors, and gas holders—is available at the Southern California Gas Company's works, a considerable saving in expenditures for large amounts of critical materials has been effected.

The estimated production of butadiene by the gas company is 30,000 tons a year. Crude butadiene will be piped from the gas plant to Shell Chemical Company near Torrance for purification, and then delivered to a copolymer plant, where it will be polymerized with styrene to produce synthetic rubber.

Underground Piping Data

AN unusually colorful and easy-to-read new technical bulletin entitled "Wrought Iron for Underground Services" has just been released by the Engineering Service Department of A. M. Byers Company, Pittsburgh.

Designed to be of service to private and municipal water works engineers, electrical and civil engineers, oil and gas operators, heating men, plant maintenance men and others, the new booklet discusses the most important factors effecting soil corrosion of underground piping, weighs theory against test results and outlines installation histories of water wells, and lines, lawn sprinkler piping, oil and gas wells and lines, gasoline lines and tanks, and electrical cable conduit.

The booklet includes many photographs of underground piping installations under varied conditions in major cities throughout all parts of the country.

Gas Furnaces operating without blowers are making quite a hit in war production plants. Temperatures above 2200° are now being reached!

Synthetic Products . . . *Natural Gas Derivatives Make Vital War Contributions*

Dr. Egloff

Part II

By Dr. Gustav Egloff

Director of Research
Universal Oil Products Co.,
Chicago, Ill.

NATURAL gas is an important source of high explosives. Natural gas in some parts of the country is being cracked into hydrogen which is combined with the nitrogen from the air, producing synthetic ammonia. The ammonia is readily oxidized with air into nitric acid. Combination of the ammonia and nitric acid produces ammonium nitrate.

Toluene Production

In World War I the maximum toluene production was at the rate of 15,000,000 gallons a year and practically all came from coal carbonization plants to derive coke for steel making, with toluene as a by-product. The toluene production in World War II from coal carbonization is at the rate of over 25,000,000 gallons a year. According to published reports the demand for toluene is from 250 to 300,000,000 gallons a year—the difference between the volume of toluene from coal and the total demand will come from petroleum, i.e., ten to twelve times as much from petroleum. In comparing the two wars the increased demand for toluene is from sixteen to twenty times. On a T.N.T. basis World War I called for 150,000,000 lbs., whereas the *present war calls for 3,000,000,000 lbs. a year.* Benzene is readily converted into carbolic acid or phenol through chlorination and hydroylsis. Combine the phenol with nitric acid and picric acid is the result, a high explosive, and when synthetic ammonia reacts with picric acid, ammonium picrate is formed, another high grade explosive.

Many natural gases contain hydrogen sulfide which when oxidized with air is converted to sulfuric acid necessary in so many arts, particularly high explosives. A number of commercial units are producing sulfuric acid based on hydrogen sulfide or elemental sulfur produced from natural gas as a starting material. So we have sulfuric and nitric acid, both produced from natural gases, raw materials necessary for high explosives needed in this present war, some of which are on a scale over twenty times that of World War I.

An important substance in war is glycerine for the production of trinitroglycerne, the commonest form of which is dynamite. The main source of glycerine has been in the splitting of fats to glycerine and fatty acids in the soap-making industry. As is well known, a campaign is on for the conservation of cooking fats of all kinds which has been requested by our government. These fats have many uses, one of them being the manufacture of soap and glycerine. A few years ago a glycerine-making process was developed by the petroleum industry starting with propane or propylene, which are chlorinated and then hydrolized to glycerine. The glycerine is then nitrated to trinitroglycerine.

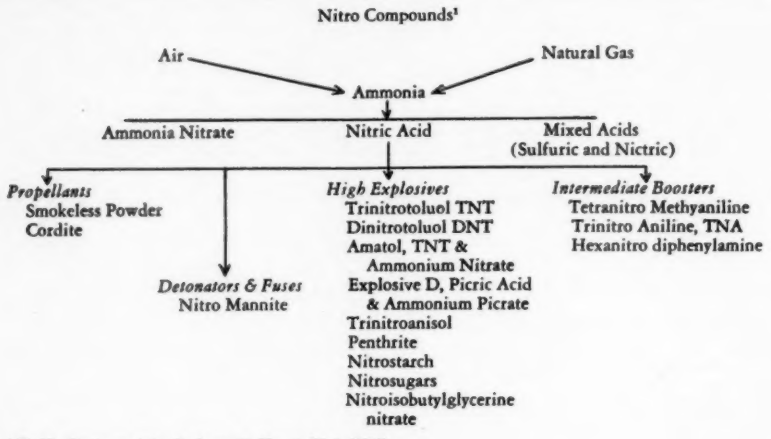
Nitroparaffins from natural gas may well develop into one of the newer and valuable sources of high explosives. Methane gas when nitrated produces tetranitromethane. This compound is the most destructive explosive known to man but extremely difficult to handle. Figure 1 shows the importance of nitro compounds in the manufacture of explosives.

Anaesthetics and Plastics

Anaesthetics are vital in a world at war. One of the primary needs of the medical profession has been anaesthetics which do not have post-operative dangers due to pneumonia and nausea. Ethylene has been shown to have properties superior to those of ether and nitrous oxide. Deep surgical anaesthesia is readily induced by ethylene and insensibility to pain comes rather quickly. A general feeling of well being and comfort with no harmful after effects is present when ethylene is used. Cyclopropane, although known since the year 1882, was still a laboratory curiosity until the end of 1930 when it was first applied in human anaesthesia. It has been rather widely adopted since as being one of the safest anaesthetics. Cyclopropane produced from either propane or propylene by a series of chemical reactions is less explosive in the hospital than either ether or ethylene.

Natural gas hydrocarbons can be used as basic materials for the synthesis of plastics after forming olefinic hydrocarbons. There are three basic reactions which in various combinations are used to produce plastics from the derived hydrocarbons; they are oxidation, halogenation (mostly chlorine is used) and polymerization.

- **As a nationally recognized authority on chemical research, Dr. Egloff's study of synthetic war products derived from natural gas is of unusual interest.**
- **In this article he discusses the conversion of hydrocarbons into aviation gasoline, lubricants, synthetic rubber, explosives, acetylene, anaesthetics, plastics, solvents and many other natural gas derivatives.**
- **Dr. Egloff's article is being published in two parts. The first part appeared in the January issue.**



[1] F. H. Dotterweich, Refiner 21 No. 3, 51-6 (1942).

Figure 1

Stemming from these reactions, the entire plastics industry has built up new materials and replacement products for many structural materials and rubber. Figure 2 shows some of the derivatives of the unsaturated hydrocarbons from natural gas.[2]

At the present time any of the components necessary for the manufacture of plastics of all types can be made from natural gas. One of the important substances for the Bakelite type of plastic manufacture is formaldehyde, made largely from the methanol or wood alcohol by the catalytic reaction of carbon monoxide and hydrogen at high pressures. For a number of years formaldehyde and methanol have been produced from the oxidation by air of natural gas. This process can be readily expanded to produce all the formaldehyde necessary in the ever expanding Bakelite program. The phenol or carbolic acid and cresols, etc., are also potentially available from natural gasoline.

One big field of research and development that merits discussion is carbon monoxide and hydrogen or the water gas reaction to form hydrocarbons. In the United States we have over 2.6 trillion cubic feet of natural gas yearly production. This gas contains about 90 per cent of methane which can be converted into carbon monoxide and hydrogen by high temperatures in the presence of steam. In Germany the Fischer-Tropsch process has been developed to produce oil from carbon monoxide and hydrogen at the rate of about 15,000,000 barrels a year. The hydrocarbons produced are methane, ethane, ethylene, propane, propylene, butanes, butylenes, gasoline, gas oil, and Diesel oil to solid paraffin wax. The reaction takes place in the presence of a catalyst, which may be oxides of nickel, chromium or cobalt, using temperatures of 400° F. and pressures of the order of 200 lbs.

The gasoline produced by the water gas reaction is poor in quality with about a 40 octane rating. The gasoline has to be cracked thermally or catalytically into higher octane fuel. The gasoline fraction boiling up to 300° F. contains olefins which polymerize with each other to form lubricating oil. These lubricating oils are produced commercially in Germany and some of them are high grade. The balance of the gasoline fraction, the paraffins, hexanes, heptanes, octanes may be thermally cracked under controlled conditions to make more olefins which in turn are converted into lubricating oil by polymerization. A portion of the synthetic oil is a high grade Diesel oil with octane number of over 100. The Diesel oil fraction is blended with lower grade Diesel oils to improve its quality.

Paraffin wax, which is also derived from the water gas reaction, is oxidized with air to make fatty acids. The fatty acids are reacted with potassium or sodium hydroxide, and soap is produced. The last report out of Germany is that one small cake of soap is al-

(Continued on page 84)

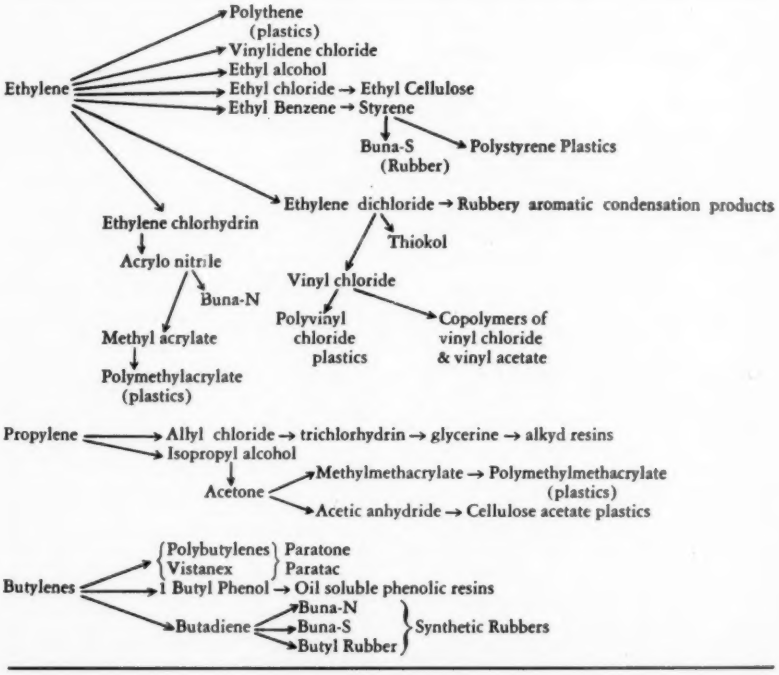


Figure 2

[1] F. H. Dotterweich, Refiner 21 No. 3, 51-6 (1942).
[2] R. L. Wakeman, Nat. Petroleum News, July 23, 1941, p. R-226.

Personal AND OTHERWISE

Elected Controller

Calvin T. Harmon

CALVIN T. HARMON was elected controller of the Philadelphia Company, the Duquesne Light Company, and the Equitable Gas Company by the boards of directors of those companies, it was announced in Pittsburgh on January 20.

Mr. Harmon entered the employ of these companies April 11, 1927, in the capacity of statistician. On November 1, 1938, he became chief accountant of the statistical division, and in September of the following year he advanced to chief of the statistical division. On December 19, 1941, he was made an assistant controller.

Previous to his association with these companies, Mr. Harmon was employed as a cost accountant with the National Metal Moulding Company, and later he was engaged as a public accountant and auditor with Collins & Company, and Haskins & Sells, both certified public accountant firms.

Mr. Harmon attended La Salle Extension University after completing his high school studies. He is married and lives in Rochester, Pa.

Win McCarter Awards and Service Emblems

IN the closing days of 1942, The Brooklyn Union Gas Company took time out from its strenuous wartime activities to pay tribute at a series of meetings to 267 of its employees who reached important service milestones and to 54 other men and two women who distinguished themselves by saving lives or performing other meritorious acts. All of those honored for long service have been with the company for 25 years and 14 have reached or passed the half-century mark.

Among those who distinguished themselves by saving lives were 12 employees, each of whom received either the McCarter medal, bar or certificate, which is awarded by the American Gas Association for outstanding resuscitations involving the use of the Schafer prone pressure method. William J. Gallavan heads the list, having won a McCarter bar for repeating his two previous life-saving performances. The following received McCarter medals: Patrick J. Brady (now in military service), M. F. Farrell, James F. Galvin, M. A. Givens, George Leaver, R. M. Rizzo, William H. Saxon, Thomas Schecker, and Michael Zoldak. McCarter certificates of assistance were awarded to William E. Barry, Frank J. Gough, and James J. Matthews.

President Clifford E. Paige presented the service emblems and Vice-President Hugh H. Cuthrell presented the McCarter awards.

By the end of the year virtually every employee in the Brooklyn company had qualified as a prone pressure operator as a result of the campaign by safety committees and sales plan group leaders of the company. December had been designated as "Prone Pressure Month" and buttons were distributed to all who showed proficiency in the life-saving technique.

Wadsworth a Major

GUY W. WADSWORTH, JR., vice-president in charge of personnel, Southern California Gas Company, Los Angeles, recently accepted a commission as major in the United States Army.

The Wadsworth pre-employment system of testing named after him and developed while he was with the gas utility, has gained national recognition and is widely used. He was formerly a member of the Committee on Personnel Practice of the American Gas Association.

WPB Advances Keeney

APPOINTMENT of Robert M. Keeney, formerly chief of the Steel Division's Nickel Section, as deputy director of the General Industrial Equipment Division, was announced Jan. 22 by William K. Frank, director of the division.

Mr. Keeney was industrial manager of the Connecticut Light & Power Company, Hartford, Connecticut, before going to the War Production Board in January, 1942. His home is in Farmington, Connecticut.

Fulton Named

EDWIN FULTON was recently named division manager of the South Carolina Electric & Gas Company, Florence, S. C. He was formerly manager of Consolidated Utilities Corp. plants located at Sumter, Anderson and Greenwood, S. C.

Standard Oil Elects Gallagher President

Ralph W. Gallagher

DIRECTORS of the Standard Oil Company of New Jersey recently elected Ralph W. Gallagher, who had served briefly as chairman of the board, to succeed the late W. S. Farish as president and chief executive officer of the company. The post of chairman, which Mr. Gallagher vacates, will not be filled at present.

A past president of the American Gas Association, Mr. Gallagher was president of The East Ohio Gas Company, Cleveland, when he was named to the board of Standard Oil Co. of New Jersey in 1933. He became a vice-president in charge of the company's extensive natural gas operations in 1937 and was elected chairman in November, 1942.

Brooklyn Honors Mary E. Dillon

Mary E. Dillon

MARY E. DILLON, president of the Brooklyn Borough Gas Company, Coney Island, N. Y., last month was awarded the Downtown Brooklyn Association's 1942 gold medal for the "most distinguished service for Brooklyn." Miss Dillon is the thirteenth person to receive the medal, and the second woman, the other being Councilman Genevieve B. Earle.

Miss Dillon is a director and past vice-president of the Brooklyn Chamber of Commerce and the Coney Island Chamber of Commerce. She is a member of the Woman's National Republican Club and a member and trustee of the governing committee of the Brooklyn Institute of Arts and Sciences. She is also serving on the Mayor's Business Advisory Committee and the War Council of the City of New York.

CP Booklet Out

CERTIFIED Performance gas range manufacturers have just mailed their booklet "What Are They Working For" to gas companies in the United States. Six newspaper advertisements are reproduced in the booklet. A copy may be secured from the Association of Gas Appliance and Equipment Manufacturers, 60 East 42nd St., New York, N. Y.

CONVENTION CALENDAR

FEBRUARY

Feb. 10-12 **American Management Association Personnel Conference**
Palmer House, Chicago, Ill.

15-18 **American Institute of Mining and Metallurgical Engineers, Annual Meeting**
New York, N. Y.

MARCH

Mar. 11-12 **A. G. A. War Conference on Industrial and Commercial Gas**
Hotel Statler, Detroit, Mich.

18 **New England Gas Association**
Hotel Statler, Boston, Mass.

APRIL

Apr. 16-17 **Missouri Association of Public Utilities**
Elms Hotel, Excelsior Springs, Mo.

26-29 **U. S. Chamber of Commerce, Annual Meeting**
New York, N. Y.

28 **A. G. A. Natural Gas Management Conference**
Gibson Hotel, Cincinnati, Ohio

29-30 **A. G. A. Distribution Conference**
Netherlands-Plaza Hotel, Cincinnati, Ohio

MAY

May 10-14 **National Fire Protection Association**
Chicago, Ill.

NOVEMBER

Nov. 29-Dec. 3 **American Society of Mechanical Engineers, Annual Meeting**
New York, N. Y.

Natural Gas Consumption Sets New Record in 1941

DEMANDS made by the war, and the substitution of natural gas for fuel oil, were reflected in natural-gas consumption in 1941 by a continuation of the expansion which began in 1939, according to the Bureau of Mines, United States Department of the Interior. Although statistics for 1942 are not yet available, further gains are expected in that year.

The marketed production, or consumption less exports, of natural gas in 1941 was 2,812,658,000,000 cubic feet, and was 6 per cent over the peak of 2,660,222,000,000 cubic feet reported in 1940. Oklahoma with a 9 per cent decline and New York with a 14 per cent decline in 1941 from the 1940 output, were the only major producing States in which production did not increase. Louisiana production increased 18 per cent; West Virginia production 10 per cent; California production 7 per cent; and Texas production 2 per cent over 1940 totals.

The consumption of natural gas reached an all time high of 2,805,192,000,000 cubic feet, 6 per cent over the peak of 2,654,659,000,000 cubic feet attained in 1940. The largest increase in demand was from miscellaneous industries, which used 19 per cent more gas than in 1940. Domestic consumption registered a slight decline, although the number of consumers increased, possibly reflecting a more frugal use of fuel in 1941. The apparent decline in field consumption resulted from the use of a new basis of reporting by a company, which has been the largest consumer in Texas. It is probable that the amount of gas actually consumed in the field increased several per cent in 1941 over that consumed in 1940.

All major classes of consumption in 1941 increased over 1940 demands except gas used in the manufacture of carbon black and for domestic purposes. The major classes of consumption were divided as follows: field use, 686,158,000,000 cubic feet (25 per cent); domestic, 442,067,000,000 cubic feet (16 per cent); commercial, 144,844,000,000 cubic feet (5 per cent); carbon-black manufacture, 365,377,000,000 cubic feet (13 per cent); fuel in petroleum refineries, 148,127,000,000 cubic feet (5 per cent); fuel in electric public-utility power plants, 205,156,000,000 cubic feet (7 per cent); and other industrial uses, 813,463,000,000 cubic feet (29 per cent). These figures show a gain of 3 per cent in gas used for miscellaneous industrial uses at the expense of gas used in the field and for the manufacture of carbon black.

The average value of gas at the wells was 4.9 cents in 1941, compared with 4.5 cents in 1940. This gain was largely due to gains in the value of gas used in the field in some of the southwestern gas fields and to the increased production of the higher priced gas in the Appalachian district. The average value of gas at points of consumption was 22.1 cents in 1941 compared with 21.7 cents in 1940. The average value of gas used by commercial consumers declined 0.6 cent to 47.2 cents in 1941. All other major classes registered increases in values over the 1940 averages.

Natural gas mixed with manufactured gas totaled 65,979,000,000 cubic feet in 1941 compared with 65,102,000,000 cubic feet in 1940. There were 9,730,110 domestic consumers (7,250,900 using straight natural, and 2,479,210 using mixed gas) in 1941 compared with 9,245,230 in 1940. The average consumption per consumer was 45,433 cubic feet in 1941 compared with 47,986 cubic feet in 1940. There were 766,910 commercial consumers in 1941, or 25,890 more than in 1940.

Exports to Canada totaled 121,000,000 cubic feet, 34 per cent over the 1940 figure. Exports to Mexico amounted to 7,345,000,000 cubic feet in 1941, closely approximating the 1936 peak of 7,352,000,000 cubic feet. Total intrastate and export movements totaled 815,672,000,000 cubic feet, a gain of 10 per cent over the 1940 figure.

The increased demand for gas stimulated drilling. There were 2,990 gas wells drilled in 1941, compared with 2,382 in 1940.

Edward M. Stevens Dies

EDWARD M. STEVENS, secretary of The Lattimer-Stevens Company, Columbus, Ohio, manufacturers of gas meter connections and other equipment, died January 10 after a short illness. He was 41 years of age.

For more than 20 years Mr. Stevens had been closely associated with the company which was founded by his father, F. E. Stevens. He received his eduation at Ohio State University, following which he entered the gas industry where he became widely known. He was a member of the American Gas Association, Association of Gas Appliance and Equipment Manufacturers, Gild of Ancient Supplers, National Association of Purchasing Agents and other civic and business organizations.

Harry E. Almberg Dies

HARRY E. ALMBERG, retired chief attorney for the Consolidated Edison Company of New York, died at his home Jan. 11. His age was 73.

When he retired in 1939 he had been chief attorney of the company forty years. Mr. Almberg was also counsel and a director of the American Scandinavian Foundation.

For years Mr. Almberg was a member of the American Gas Association's Committee on Amendments to Constitution.

Nicholas Stahl Dies

NICHOLAS STAHL, chief engineer of the Pennsylvania Power & Light Co., at Allentown, Pa., died January 1. He was 66 years old.

A graduate of Princeton University, Mr. Stahl had been an engineer for more than 35 years. He was a member of the American Gas Association, American Society of Mechanical Engineers, Pennsylvania Electric Association, American Society for Testing Materials, and American Institute of Electrical Engineers. He was a consulting engineer for the Federal Rural Electrification Committee.

Accounting SECTION

L. A. MAYO, *Chairman*
O. H. RITENOUR, *Vice-Chairman*
O. W. BREWER, *Secretary*

Block Rate Computations

By WARREN J. ROOT

Rochester Gas and Electric Corporation
Rochester, New York

THIS article describes an accurate and efficient method of computing service bills, rendered on straight monthly block rates, for both regular and irregular periods.

Block rates are generally predicated on a monthly basis and, therefore, as initial and final bills frequently cover an irregular period, it requires that they be rendered on a prorated basis. Prorating is usually on a per day or fractional part of a month basis.

Charts for block rates can be readily prepared to show the billing amounts associated with the most frequently encountered monthly units of consumption. To provide individual charts for each irregular period would involve considerable work and result in a voluminous record.

The subject chart (Exhibit A) and method, while permitting the calculation of one month accounts, does not presume to replace the monthly chart. Its prime purpose is to provide a means of quick and accurate calculations for bills covering a period other than one month. However, the chart may likewise be used for calculating the amounts of large consumptions not included on the monthly chart.

Explanation of Method

The method involves one multiplication of the total consumption by the unit price of the block in which the consumption ends, plus a correction factor amount representing the excess cost of consumption units in the prior blocks of the rate.

Following is a comparison of a normal calculation and the correction factor method for obtaining the net monthly billing amount for 86 hundred cubic feet, under a specimen rate:

NORMAL CALCULATION

Block	*C. Cu.Ft. in Block*	*Unit Cost Net*	*C. Cu.Ft. Chg. Net*
1	5	Min. Chg.	$ .75
2	45	X $.103	4.635
3	36	X .0824	2.966
Total	86		$8.35

CORRECTION FACTOR METHOD

Total Cons.		86 C. Cu.Ft.
Unit Cost of Ending Block	X	.0824
		$7.086
Plus 3rd Block Correction Factor		1.265
		$8.35

Preparation of Chart (Net Only)

Preliminary to the preparation of the extension chart (Exhibit A) certain necessary basic (one month) information is developed as illustrated and explained below:

(a) *Block No.*	(b) *C. Cu.Ft. Blocks*		(c) *Accumulative C. Cu.Ft.*	(d) *Unit Price Per C. Cu.Ft.*
1	First	5	5	$. . . .
2	Next	45	50	.1030
3	"	50	100	.0824
4	"	100	200	.0770
5	"	300	500	.0670
6	"	3,000	3,500	.0618
7	"	3,500	7,000	.0567
8	Over	7,000	. . . .	.0382

(e) *Value Each Block*	(f) *Accumulative Value*	(g) *Correction Factor*
$ .75	$ .75	$ .75
4.635	5.385	.235
4.120	9.505	1.265
7.700	17.205	1.805
20.100	37.305	3.805
185.400	222.705	6.405
198.450	421.155	24.255
. . . . .	. . . . .	153.755

The block rate for which the chart is to be prepared is copied into columns a, b,

EXHIBIT A—EXTENSION CHART

(a) *Block*		*1*		*2*		*3*		*4*		*7*		*8*	
Price Per (d) *100 Cu.Ft.*		*Gross* —	*Net* —	*Gross* .113	*Net* .103	*Gross* .084	*Net* .0824	*Gross* .0785	*Net* .077	*Gross* .0578	*Net* .0567	*Gross* .0389	*Net* .0382
Days	*Mo.*			**Consumption and Correction Factors*									
6–12	⅓	.28	1 .25	.088	16 .078	.572	33 .422	.755	66 .602	2,333 8.385	8.085	52.485	51.252
13–17	½	.42	2 .38	.133	25 .118	.858	50 .633	1.133	100 .903	3,500 12.578	12.128	78.728	76.878
18–24	⅔	.55	3 .50	.177	33 .157	1.143	66 .843	1.510	133 1.203	4,666 16.770	16.170	104.970	102.503
(c) (g) 25–35	1	.83	5 .75	.265	50 .235	1.715	100 1.265	2.265	200 1.805	7,000 25.155	24.255	157.455	153.755
36–42	1⅓	1.11	6 1.00	.353	66 .313	2.287	133 1.687	3.020	266 2.407	9,333 33.540	32.340	209.940	205.007

*Consumption figures—red
Correction factors—black

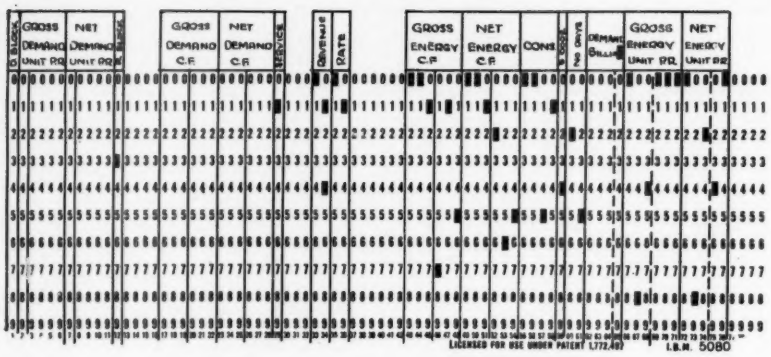


EXHIBIT B—MULTIPLYING MASTER CARD

and d. Each block is then extended and the values are entered in column e. Accumulative consumption units and values are determined and entered in columns c and f.

Correction factors for each block, as entered in column g, represent the difference between the actual value of the consumption units in the preceding blocks and the value of those consumption units at the unit price of the succeeding block; i.e., the correction factor for block three is determined as follows:

Value of 50 C. Cu.ft. in first two blocks (column f)	$5.385
Value of 50 C. Cu.ft. at unit price of block 3 ($.0824)	4.12
Correction factor for any calculation in block 3	$1.265

The extension chart can be developed by individual days or fractional parts of a month, to any desired limit from the one month basic data.

The chart (Exhibit A) has been developed on a ⅓, ½, and ⅔ month basis and as illustrated will provide billing amounts for any consumption for any period of use from 6 to 42 days.

The basic (one month) information as shown on lines a, b, c, and g, was obtained as illustrated above in columns similarly identified. It is to be noted, however, that the figures on line c are the accumulative units of consumption at each block.

From this point the chart can easily be extended to cover as many irregular periods as considered necessary by applying the desired fractions to the monthly consumption units and correction factor amounts; i.e., the line for ⅓ of a month represents ⅓ of the consumption units and correction factor amounts as shown on lines c and g. The line for 1⅓ months is then a total of the lines for ⅓ of a month and one month.

Fractions of consumption units remaining after the completion of any division or totalization should never be corrected to the next higher unit of consumption. Correction factor amounts should be adjusted to two or three decimals depending on the number of decimals in the unit price per hundred cubic feet, line d.

Use of Extension Chart

Previously under "Explanation of Method" the extension for 86 hundred cubic feet for one month was illustrated. Assuming that this consumption had been used in a 41-day period instead of one month, by use of the chart, the net extension can readily be obtained. Forty-one days is determined by the chart to be 1⅓ months. For this period, 86 hundred cubic feet should be figured in the third block (being greater than 50 and less than 100); this consumption extended at $.0824, the net unit price of the third block, equals $7.086; the net correction factor of $1.687 added to this amount equals $8.77, completing the extension.

Adaptation to Hollerith System of Billing

The calculations as previously described may be accomplished mechanically through the use of a No. 601 Multiplying Punch with crossfooter, actuated by Master Cards (Exhibit B). These cards are punched directly from the Extension Chart (Exhibit A). The sample illustrated is for the extension of one month bills in the third block of the rate.

The group of accounts most profitably extended by this method include:

1. Pro-rated accounts within the limits of the prepared charts.
2. Accounts whose one month's use is in excess of the limits established for extension by regular master cards and the Reproducing Gang Punch.
3. Accounts on rates for which regular master cards were never provided due to the wide range in consumption units.

Processing Detail Cards (Exhibit C) for Multiplication

Auditing: At the time the meter reading book is being reviewed for current billing, irregular period accounts are prepared for extension on the Multiplying Punch by entering the elapsed days since the previous billing on the face of the Advance Card. (For simplification of subsequent operations, the number of days actually written on the card is the first day of the day group in which the actual number of days is included.)

Hand Punching: This operation, for cards to be extended on the Multiplying Punch, is completed by punching the number of days as written on the card, after punching the customary present reading, consumption, and billing code.

Sorting for Extensions: In this operation the total number of detail cards are readily divided into three groups:

1. Those for extension by regular master cards and the Reproducing Gang Punch.
2. Those representing exceptions to automatic extension and for which it has been necessary to write the billing amounts on the cards and also to hand punch them.
3. Those punched with number of days and subject to extension by the Multiplying Punch.

Cards as identified in group three are preceded into the sorter by the multiplying master cards for all rates and are sorted to:

(a) Consumption Step.
(b) Number of Days. (The cards are now in sequence by number of days by consumption step, which also is by day groups by rate blocks, as separated by the master cards. Had actual days, instead of the first day of the day group been written in, as mentioned under "Auditing," the cards would have been in consumption step sequence by each individual day, which means by days by blocks, instead of day groups by blocks.)

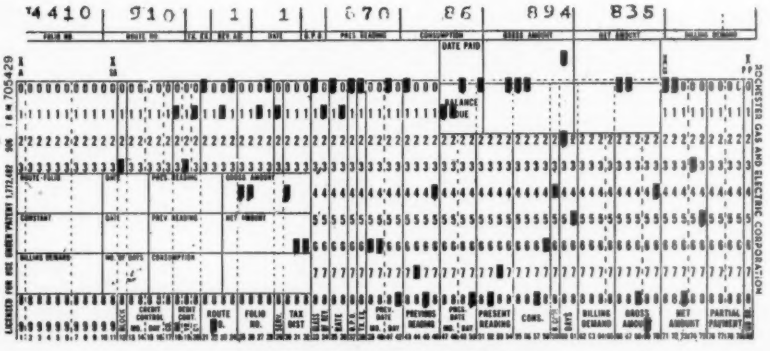


EXHIBIT C—DETAIL CARD

EXHIBIT D—PROOF OF EXTENSIONS (GAS)

Service Code	Rate Code	Days Group	Block No.	No. of Cards	C. Cu.Ft. Consumption	Gross Amount	Net Amount
1	1	6	2	8	26	3.62	3.28
1	1	13	1	3	6	1.26	1.14
1	1	13	2	18	164	20.94	19.03
1	1	18	2	16	188	24.10	21.90
1	1	18	3	2	92	10.01	9.27
1	1	25	1	2	2	1.66	1.50
1	1	25	5	12	4,064	329.23	317.98
1	1	36	2	5	180	22.12	20.12
1	1	55	2	35	1,156	149.15	135.49
1	1	85	2	9	432	55.99	50.86
1	4	25	4	13	4,342	266.98	256.15
1	4	25	5	9	5,790	324.16	314.03

(c) Rate Classification Code.

Reproducing: The rate block code as it appears on the master cards is reproduced into the detail cards to facilitate the "Proof of Extension" to be later described.

Multiplying: The No. 601 Multiplying Punch with crossfooter is normally equipped to retain a common multiplier from a master card in group multiplying operations. An additional circuit, however, must be installed to retain the common correction factor from each master card.

The actual multiplication and punching are automatic. The Multiplying Punch multiplies the consumption, as punched in each detail card, times the unit price punched in the preceding master card, adds to this product the correction factor as punched in that master card, and then punches the completed extension in the detail card.

Proof of Extensions: Following the multiplying operation and the removal of the master cards the detail cards are tabulated as illustrated by Exhibit D to provide a proof of the extensions.

The detail cards as sorted are by rates, each rate is in order by day groups, each day group is in order by rate blocks and identified by rate block numbers as reproduced from the master cards. In tabulating the proof sheet, these three factors are controlled so that all cards of one rate for a day group and rate block are added together.

Proof of extensions is then accomplished for each tabulated group by multiplying the total consumption times the unit price for that day group and block as shown by the chart (Exhibit A) and to this product adding a total of correction factors, which would be the correction factor as shown by the chart, multiplied by the number of cards in the tabulated group. Inasmuch as these cards were individually extended and corrected automatically to the nearest half cent, a variation of not more than $.005 per card between the total as shown on the tabulation and the total as calculated would be considered as proof that all extensions had been correctly made.

Accounting Proceedings Made Available

PROCEEDINGS of the American Gas Association Accounting Section meetings held last October during the Association's annual meeting in Chicago, have been printed in pamphlet form and are available at 50¢ a copy. This 50-page booklet includes reports and discussions sponsored by the Customer Activities and General Accounting groups of the Section as well as the minutes of the annual meeting. Also included is a summary of developments in depreciation accounting and the report of the Insurance Committee.

Of particular interest is the timely discussion of bi-monthly and quarterly meter reading and billing, materials and supplies problems, accounting administration during the war, and steps taken to meet the manpower shortage.

This Section of the Proceedings will also be included in the annual A. G. A. Proceedings which will be published later in book form.

Book Review

The Federal Power Commission and State Utility Regulation. By Robert D. Baum. 301 pages; $3.75: American Council of Public Affairs, 2163 Florida Ave., Washington, D. C.

BASED on more than two years of first-hand contact with the staff and records of the Federal Power Commission, it discusses the administrative, legal, accounting, and engineering tasks of the Commission, particularly as they relate to state controls in the fields of water power conservation, electric utility and natural gas company regulation, flood control, and national defense. While the study is organized primarily in terms of the operation of the Commission, the aim throughout is to show the extent and manner of Federal-state collaboration, the various points of conflict, and the effects of the Commission's work upon state regulation.

The study covers in detail the jurisdictional controversies between the Commission and the states over the Federal Water Power Act of 1920, the Federal Power Act of 1935, and the Natural Gas and Flood Control Acts of 1938; and the procedures and experiences of the Commission in issuing and supervising water power licenses and conducting water power investigations and river-basin surveys for flood control.

A description of the Commission's procedures and policies in regulating the rates of licenses, electric and gas utilities is followed by a review of its efforts to liberate state utility regulation from the traditional "fairvalue" formula by securing full Supreme Court recognition of the sufficiency of the prudent investment rate base. The work of the Commission in regulating mergers, securities, extensions and abandonments, and other intercorporative relations is analyzed with special reference to the means devised to minimize the overlapping of Federal and state controls.

High School Boys Read Gas Meters

FACED with heavy losses to the armed forces from the ranks of meter readers and having exhausted all overtime possibilities of regular crews, the Southern California Gas Company is continuing to tap a new reservoir of manpower during the emergency by hiring additional high school boys between the ages of 15 and 18 in the capacity of part-time meter indexers. According to L. A. Blomgren, who is in charge of their training and supervision, 20 boys are now indexing meters on a fractional day basis.

Tried out experimentally in Eagle Rock, the program is in satisfactory operation in two other districts and probably will be expanded, Mr. Blomgren said. The boys work in groups of six under a "lead indexer." All attend the various high schools near their territory and give three hours in the afternoon to the meter indexing job. Portions of meter books are taken out and brought in by messengers.

Veteran Richmond, Va., Utility Man Dies

WILLIAM PARKES KNOWLES, veteran Richmond, Va., municipal government employee with 66 years of service with the city, died Christmas morning. He was 91 years old.

Member of a prominent Virginia family, Mr. Knowles started with the city utilities department as a gas inspector in 1876, and worked his way up to the superintendency. He was the oldest city employee, both in age and in point of service, at the time of his death.

Mr. Knowles was a member of the American Gas Association for 16 years.

Avoiding Decarburization

By C. GEORGE SEGELER

Engineer of Utilization, American Gas Association

WORDS come into common use so rapidly that everyone takes it for granted that their meanings are perfectly understood. To be sure, decarburization is no new word, but a restatement of its meaning may help to shed light on the means to avoid it.

The decarburization of steel may be broadly defined as the loss of carbon from the surface areas of the piece being heat treated as a result of the reactions between the hot furnace atmosphere and the steel. This effect may take place during any part of the heat-treating process—heating, holding or cooling. The definition may be simple enough but from that point on the problem is anything but simple.

Extent of Decarburization

The extent to which decarburization will occur involves many factors, but four of these stand out as most important.

First: In the case of a given tool or part, the composition of the particular steel will have a great effect on the extent and the speed with which it may decarburize. Technical data is now available for most steels showing how they react with given atmospheres, and in case of trouble, the substitution of a less sensitive steel is one method of eliminating decarburization.

Second: Decarburization increases the longer a piece is kept in the furnace. Generally, there is not much that can be done to reduce the time factor although it may be possible to change to a steel requiring less time.

The third factor is the temperature and, as in the case of time, there is not much that can be done about it with a given steel, presuming that the correct heat treatment is being used. Furthermore, the hardening of medium and high carbon steels takes place at temperatures at which the furnace gases react with one another so that conditions in the furnace are often quite different than anticipated. This leads right up to the vital problem of atmosphere control.

The fourth factor is the one most susceptible to modification and control and is the basis on which the greatest progress in the prevention of decarburization has been made. I refer to the control of the furnace atmosphere so that it will be of such a composition that at the temperature of heat treatment and for the length of period needed and for the steel in question, no carbon will be lost.

In order to crystallize our discussion of avoiding decarburization, we might spend a moment on methods of recognizing it other than having the goods come back from the purchasers marked "Not up to specifications."

We will assume that the problem of decarburization has been narrowed down to determining whether or not a given steel can be satisfactorily treated in the available furnace and atmosphere. The information now needed with regard to the steel can be determined by hardness test, by photomicrographs, by chemical analysis of a number of cuts or by the change in weight of a test piece provided that no scaling has occurred.

Hardness Test

All of these methods have their advantages and disadvantages, and if space permitted, it would be desirable to consider these in detail. However, for the run-of-mill use, the hardness test is probably a satisfactory procedure, at least up to that point where more sensitive and accurate methods must be applied. To help interpret the hardness test, it has been suggested that a series of steps be ground on the piece, each one being .005" deeper than the next one. If the hardness test values decrease on deeper cuts, this indicates that decarburization has occurred. On the other hand, if the hardness values are uniform at the various depths but lower than the maximum hardness which can be developed for the steel, then it may reasonably be supposed that something other than decarburization is wrong with the heat treatment.

The change in weight method has been adopted to a considerable extent by scientific workers because it gives quantitative data useful for comparing one atmosphere with another. The change in weight method does not indicate the depth to which decarburization has occurred. This method has advantages in being fast, accurate and quantitative provided that no scaling has taken place.

Suppose that we have determined that decarburization has occurred in a given article. How can it be avoided? We may consider changing the steel, reducing time and temperature, and finally, selection of a better atmosphere. If the last is the most practical step to take, then we have a choice of two methods, depending on conditions.

If we recognize the unsuitable nature of our existing furnace, then the only thing to do is to go to a builder of furnace atmosphere equipment specializing in atmospheres which will neither carburize nor decarburize for the steel in question. Such a manufacturer can supply the right equipment.

If we must use the units already on hand, then careful analysis of the furnace atmosphere gases should be made, being sure to evaluate or measure the amount of water vapor present. If this analysis shows the presence of carbon dioxide and water vapor, then the atmosphere is open to suspicion as the cause of decarburization. It will be absolutely necessary to add the right auxiliary equipment to get rid of practically all of the CO_2 and to remove the H_2O to very low levels.

If you cannot get rid of these gases, there is another procedure that may be applied in some cases. It is one of the earliest methods of getting around decarburization. If a light scale can be permitted, it is possible to use slightly oxidizing atmospheres such as can be produced in direct-fired gas furnaces and obtain little or no decarburization on certain high carbon and tool steels. Temperatures must be kept as low as practical and the time must be at an absolute minimum. Within limitations hardening of steels requiring temperatures not greater than 1600° F. in an atmosphere containing from 2% to 5% oxygen in the furnace is practical. The piece will be slightly scaled, but this can be ground off. It is not possible to carry out work like this in a so-called neutral atmosphere or in a reducing atmosphere for these will cause serious decarburization.

High speed steels may scale excessively under such treatment, and it is probably impossible to heat treat them in direct-fired or in muffle furnaces without producing both decarburizing and scaling. However, when it is possible to grind off the soft skin, such steels are treated in a highly reducing atmosphere. The high molybdenum types of high speed steels may be difficult to handle in direct-fired furnaces because of excessive decarburization. However, the most recent Government directives will result in increased availability of the

Presented before War Production Conference, Hotel Pennsylvania, N. Y., January 7, 1943.

intermediate types containing lower amounts of molybdenum and higher amounts of tungsten. Such steels can be treated in substantially the same atmospheres as have been used for tungsten steels.

Other methods of avoiding decarburization are based upon coating the work. Borax, copper paint, and other materials have been used with varying degrees of effectiveness.

One company manufactures a patented furnace using a special lithium atmosphere which affords another method of avoiding decarburization.

The use of salt bath furnaces for heat treating is a growing means for preventing decarburization and has had considerable recent application, particularly in the midwest. The temperatures can be carried to high levels, and the use of proper salts affords protection against decarburization. However, the high conductivity of salt furnaces heats work more quickly and thereby may afford both an advantage and a disadvantage, the former being the speed and the latter being the danger of distortion. There is also the self-evident point that salt bath operations are suitable for production work but not for heat treatment of a small number of parts at a time since the cost of maintaining salt baths at temperature is an important item, and they are not so well suited for intermittent use. In connection with the salt baths, it is necessary to bear in mind that they are not a panacea for prevention of decarburization although they are an effective means for this purpose if properly employed. The salts are originally inert to steel, but after continued use at high temperatures, they oxidize to carbonate or oxide form, and in this condition, are decarburizing to steel, especially if a long heat treatment is required.

Pitfalls in Furnace Atmosphere

I would like to summarize by mentioning some of the pitfalls which I have encountered in recent work in various plants in and around the metropolitan New York area in connection with special furnace atmospheres.

(1) The application of the wrong type of special atmosphere to a given job. When this is the cause of trouble, the right thing to do is to get new equipment. In some cases, it might be possible to secure or build supplementary gas purification units which would produce an atmosphere that would solve the problem. For example, if you were annealing low carbon steel satisfactorily in a partially burned gas atmosphere and then started to use high carbon steel, decarburization could be expected. It is possible to remove the CO_2 and the water from the partially cracked gas by means of chemical absorbers and dryers if necessary. Another method would involve the reprocessing of the gas by passing through hot charcoal. These things sound simple, but actually, the scale on which work has to be done introduces plenty of difficulty and expense.

(2) Proper equipment applied to the job, but one of several breakdowns or blocks prevents adequate supplies of gas of the expected composition reaching the furnace. This obviously involves proper maintenance of the special atmosphere equipment, but the unfamiliarity of many shop men with the design and operation of such units may make the trouble hard to find and to solve. It is also a temptation to attribute difficulties that cannot readily be located to the unit when the real trouble may be elsewhere. It is easy to see how a slight misadjustment could produce small amounts of impurities which would be in ratios that are not neutral to the metal being treated. The cure for this condition is vigilant supervision of the equipment to see that it is in first-class operating shape.

(3) Small leaks in the muffles containing the special atmosphere. Naturally, the muffles are kept under pressure, say, one or two inches of water, and therefore, it is easy to dismiss this cause of difficulty by pointing out that any leakage is outward. A recent case illustrates the error in this reasoning. Coil steel strip was being allowed to cool in a muffle supplied with atmosphere gas at 1¼" pressure. The muffle was a rectangular box, and there was a small hole about the size of a pencil point from which a flame continued to play right until the steel was cold. Then, the muffle was opened, and all of the strip that was in the muffle near the hole was blued, indicating the presence of water vapor at this point. This took place even though a flame was burning, as described. On the hot inside of the muffle, oxygen combined with hydrogen to produce water vapor which did not diffuse very far into the interior of the muffle before its effect was spent on the nearby steel. This same problem points to the need for an adequate sand seal carefully applied; 4 in. or more of sand seal should be a minimum and 8 in. are preferable. Adequate supplies of special atmosphere gas are needed, say 5 cu.ft. per hour per foot of sand seal.

(4) Damage to the product done prior

(Continued on next page)

Industrial Gas War Conference
in Detroit, March 11 and 12

Ben H. Gardner

BEN H. GARDNER, chairman of the Industrial and Commercial Gas Section has announced that the A. G. A. War Conference on Industrial and Commercial Gas will be held at the Hotel Statler, Detroit, Michigan, Thursday and Friday, March 11 and 12.

The conference will feature two forums of gas men, manufacturers and government officials. One forum will analyze Limitation Orders L-31 and L-174 as they apply to all industrial and commercial gas situations, and the other forum will deal with commercial and industrial equipment as it is affected by government orders and war conditions.

Other features of the War Conference will be papers, discussions and a question period on heat-treating developments and applications for both ferrous and non-ferrous metals, particularly as they apply to war production work; views by the Ordnance Department on cooperation with gas companies; presentations by well informed men of the effect of war-time experiences on post-war industrial and commercial developments; and the views of customers' production men on what the gas business can do to still further help increase war production and improve the preparation of food in quantity. Commercial and industrial maintenance problems will receive full attention.

The program for the conference has been completed by a committee of utility men and manufacturers under the chairmanship of Hale A. Clark. Members of the committee are:

Geo. L. Ballard, Panhandle Eastern Pipe Line Co.
Henry M. Heyn, Surface Combustion Div.
Newell E. Loomis, Michigan Consolidated Gas Co.
Franklin T. Rainey, The Ohio Fuel Gas Co.
E. J. Shermire, Detroit-Michigan Stove Co.
Charles G. Young, Springfield Gas Light Co.
Eugene D. Milener, Secretary, American Gas Association

Hotel reservations for the A. G. A. War Conference on Industrial and Commercial Gas should be made directly with Hotel Statler, Detroit, as early as possible.

INDUSTRIAL AND COMMERCIAL GAS ADVERTISING FOR FEBRUARY

The National Advertising Committee of the Industrial and Commercial Gas Section, J. P. Leinroth, chairman, and F. B. Jones, vice-chairman, announces that full page advertisements will appear in the trade and business magazines listed below during the month of February. These advertisements are prepared in cooperation with the Committee on National Advertising as a part of the industry's national advertising campaign.

MAGAZINE	THEME
	General Manufacturing
BUSINESS WEEK (Feb. 13)	IF the parts are right . . . weapons will fire accurately . . . and that's where GAS fits in.
	Metals Industry
THE IRON AGE (Feb. 18) INDUSTRIAL HEATING METALS AND ALLOYS	This machine gun has 286 parts, many heat-treated with *GAS!*
	Ceramic Industry
GLASS INDUSTRY	Eye glasses for the armed forces in the field . . . another contribution to the war effort.
	Hotel and Restaurant Field
HOTEL MANAGEMENT	To launch ships *FASTER* . . . calls for more nutritious foods! That calls for *GAS* and the best GAS cooking equipment.
	Hospital Field
MODERN HOSPITAL	"So long! . . . take good care of my patients!"

Bryant Heater Gets Army-Navy E

THE Bryant Heater Company, peacetime manufacturers of gas heating and air conditioning equipment, have joined the select company of distinguished industrial firms who have been awarded the Army-Navy production award. Presentation of the Army-Navy E emblem for outstanding war production was made at an impressive ceremony January 8.

Armor piercing shot is tested in a large Mid-Western ordnance plant, by repeatedly submerging in water at 212°, each time followed by submerging in water at 40°. A gas boiler keeps the hot water at the right temperature without any attention.

♦

Practical helps in maintaining gas equipment take up a half page in the January issue of "Chain Store Age"—Fountain and Restaurant Section. If these tips are followed by the Fountains in your area your troubles will certainly be less.

Quantity Cookery in War Time

HEAVY *Duty News* published by American Stove Company for its commercial cooking and baking field organization is an alert house organ doing a fine job in furthering the important task of feeding the Army, Navy and essential war workers. The program of simplification and standardization of heavy duty gas equipment described in the last issue shows to what extent it is possible to conserve essential materials and concentrate on not-so-fancy equipment. WPB sent a nice endorsement of the program.

AVOIDING DECARBURIZATION

(Continued from preceding page)

to admission to the furnace so that the heat treatment gets the blame for something that has occurred elsewhere. Once discovered, solution in a difficulty of this source is self-evident, but there have been many special furnace applications to products which have been forged, brazed or otherwise exposed to heating prior to heat treatment in a special atmosphere. In cases of this kind, it is important that the condition of the metal be known as it enters the heat-treating furnace. In this same category, we can consider another occasional problem which arises when the Purchasing Department is unable to get a given specified steel and substitutes something else for it without advising the heat treaters. This problem becomes most critical when handling special alloy steels, some of which vary markedly in their sensitivity to furnace atmospheres.

High Explosive Shells Gas Heat-Treated

Photo courtesy of Mahr Manufacturing Company

Modern gas-fired heat-treating assembly for high explosive shells. These furnaces automatically harden, quench and temper 75mm., 90mm. and 105mm. shell at high production rates. Every twenty-four hours of each day many gas-fired furnaces such as these are heat-treating thousands of shell and shot for destruction of the Axis.

Technical SECTION

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Producer Gas Sets and Gas Containers for Traction

Town Gas and Methane for Short-Range Work, Producer Units for Heavier Vehicles

The American Gas Association has received a number of inquiries from its members, government officials and representatives of the Armed Forces on the subject of substitutes for gasoline, and feels that the accompanying article presents timely information on British practice. The Technical Section Committee on the Operation of Public Utility Motor Vehicles is now looking into the possible use of gas producers at the request of one branch of the United States Armed Forces.

By G. W. L. DAY

of the British Coal Utilisation Research Association; Author of Many Technical Papers Dealing with Various Aspects of Industrial Economy

ARGUMENTS are sometimes heard about the competition between the producer gas unit and the gas container to replace gasoline, but actually the two are no more competitive than the short-range fighter plane and the long-distance bomber, for each has its own special province. Town gas and methane are more suitable for short-range operation and for flexibility where there are many starts and stops, while the producer gas unit has the advantage in larger transport programs for heavy vehicles with loads fairly regular and stops not too long. Let us consider first the technique and economics of town gas utilization.

The low-pressure gas-bag container, which dates from the last war, presents special problems of its own, and its design and construction have a marked effect on the road performance. Apart from having to provide enough gas for a reasonable mileage and yet not offer too much wind resistance, the bag must at all times be under control, so that it collapses regularly and does not block the gas outlet; moreover there must be little friction between the bag and the crate.

Two Modern Types

It is these last two problems which have proved most difficult and have occasioned so much experimental work. In the wooden crate box type, shown in Fig. I, the front of the box is open so that wind pressure forces the gas to the back. The gas connection is made at the back of the bag, the fabric being supported on the sides of the box by the outlet to prevent it being blocked when the bag is nearly empty.

In another interesting "concertina" type of container the bag is held between two rigid angle-iron frames which remain in parallel planes regardless of the amount of gas in the bag, so that the bag is always under control.

It is desirable that at least 20 miles should be covered with one fill-up, and Table I shows what bag capacities are needed for various vehicles to give this mileage.

As regards road performance on town gas as compared with gasoline, Table II gives the results of a test carried out with a 4-cylinder Austin 10 auto, fitted with a low box-type of gas-bag of 220 cu.ft. capacity.

The economics of conversion to gas-bag running and the consumption of gas are illustrated by some figures taken from the Transport Section of the Gas, Light and Coke Company.

Economics of Conversion

Twenty-five vehicles of various types were converted at an average cost of $128 per vehicle. The average mileage per month per vehicle was 1,040, which required 43 gallons of gasoline before, and 67 therms of gas after conversion. Taking 300 cu.ft. of gas as the equivalent of one gallon of gasoline, the total saving in gasoline during six months has been 7,000 gallons.

So much for low-pressure methods of supply; but the modern development of this form of traction depends upon the compression of the gas to pressures round about 3000 lbs. per sq.in., and the storage of it in special containers. It is compressed by means of 4 or 6-stage compressors to 5000 lbs. per sq.in., with the necessary inter-coolers and drains between each stage. Compressors with an output of 80 or 100 cu.ft. per min. of free gas will probably become standardized for the larger filling stations.

Owing to the compression, condensation of some of the unsaturated hydrocarbons occurs and this causes lubrication difficulties. The gas must therefore be de-benzolized by a special process.

Evolution Linked with Steel Development

The compressed, de-benzolized gas passes from the compressor to storage cylinders of from 5 to 23 cu.ft. water capacity. These cylinders are a most important part of the process, and indeed the evolution of the gas container is linked with the development of the nickel-chrome-molybdenum steel from which they are made.

The construction of thin-walled cylinders, due to Messrs. Vickers-Armstrong and the Chesterfield Tube Co., with the collaboration of the Government Explosives Department, is an important engineering

TABLE I

H.P.	*Approximate M.P.G.**	*Approximate Capacity of Bag in cu.ft. for 20 mi.*
8	40	150
10	36	175
12	24	260
16	20	300
20	18	350

* All figures in this article refer to Imperial gallons. To convert to U. S. gallons multiply by 1.2.

TABLE II

Acceleration and Performance	*Gasoline (Bag Full)**	*Gas*
Test Hill 1 in 13	2nd Gear	2nd Gear
Acceleration 0–25 m.p.h.	14 secs.	14.6 secs.
Max. Speed, North, South	48 m.p.h.	45 m.p.h.
Max. Speed, South, North	39 m.p.h.	32 m.p.h.
Mean Speed	43.5 m.p.h.	38.5 m.p.h.
Consumption	28–30 m.p.g.	21–22 mi./220 cu.ft.
Cruising Speed	30–35 m.p.h.	30 m.p.h.

Fig. 1. Wooden crate box-type gas container used by the Gas Light & Coke Company, London

feat. After much research, the maximum working stress was limited to 25 tons per sq.in., and for a standard vehicle cylinder of 8 in. diameter the wall thickness is only about 0.22 in. The weight of such a cylinder 74 in. in length is 124 lbs. and the volume of free gas stored in it at a pressure of 3000 lbs. per sq.in. is approximately 330 cu.ft. The life of these cylinders is at present about six years.

For the successful running of a vehicle on compressed gas, a highly important part of the equipment is the reducing valve, which reduces the pressure of the stored gas to atmospheric pressure and passes the necessary quantity to suit the varying load of the engine. The reduction is usually performed in two stages, the first lowering it from 6 to 8 lbs. per sq.in. and the second to atmospheric pressure. A gas mixer corresponding to a carburettor then mixes the gas with air before it enters the cylinders. A simple form of mixer consists of a perforated or slotted choke, through which the gas is passed after being metered by an orifice plate.

Storage System in Trailer

On some vehicles it might be awkward to find room for the storage bottles, so a scheme has been introduced whereby a complete storage system, including bottles and the first-stage reducing valve, is housed compactly on a trailer. In this case fuel is supplied to the engine by means of a flexible hose fitted with a quick connection adaptor.

This method has advantages from the standpoint of operating costs, and in cases where a fleet of vehicles is operating, additional units can be kept at the filling station, where they are charged and used for replacements. Three or six bottle trailers are generally used, the smaller for light vehicles having a range of 40 to 50 miles on a single charge, the larger for vehicles up to five tons giving a mileage of 60 to 85.

In arriving at a figure for capital and running costs, we have to consider the costs of equipment, compressing and storage, and the fuel itself, which depend upon a number of variable factors such as the capacity of the storage bottles, labor charges and the power for driving the compressor. Taking a station with two electrically driven compressors having capacities of 100 cu.ft. of free gas per min. to a final pressure of 5000 lbs. per sq.in., running all the year round, 18 hours daily and 6½ days a week, we can draw up a table as follows:—

TABLE III

Capital Costs	
(1) Two motors, with fittings and de-benzolizing plant	$18,000
(2) 27 storage bottles of 19 cu.ft. water capacity, having a free gas capacity of 6,300 cu.ft. each at 5000 lbs. per sq.in.	$22,000
(3) Compressing Station, buildings and offices	$ 4,000
(4) Extras	$ 2,000
	$46,000
Annual Costs	
Interest on Capital Outlay, Depreciation, Maintenance and Repairs	$ 7,400
Operating Costs	
Power Charges 608,400 K.W. hours electricity at just under 15 cents per unit	$ 8,112
Labor and etceteras	$ 3,000
	$18.512

Equivalent Gasoline Output

Assuming that 1 gallon of gasoline equals 300 cu.ft. of gas, the output of the above plant corresponds to 73 million cu.ft. per annum, or 243,000 gallons.

Total cost of compressing per equivalent gallon	4.57 pence
Cost of gas per equivalent gallon at 5d (between 8 and 9 cents) a therm	7.3 pence
Total cost per equivalent gallon	11.87 pence

If we add to this figure something to cover the charges of vehicle equipment, we get as a rough average total, 1/2½d. to 1/3½d (say 24 to 26 cents) per equivalent gallon. But if the compressing and storage equipment were produced in quantity, these costs could probably be reduced by at least 30%.

Washed Sludge Gas

A similar table of costs made out for washed sludge gas containing 95% methane, and taking 155 cu.ft. of washed sludge gas as the equivalent of 1 gallon of gasoline, gives for the total costs of compression and storage per equivalent gallon of gasoline the figure 3.46d (about 6 cents) (as compared with 4.57d for town's gas). As to the costs of supply of the free gas itself, this would depend upon the source and how the supply system was developed.

As regards power loss on conversion to town gas, the following table gives the results obtained from the simple conversion of a 7 h.p. 4-cylinder engine.

TABLE IV

	Max. B.H.P.	*Fuel Consumption per B.H.P. hr.*	*Brake Thermal Efficiency %*
On Gasoline	11.2	..	22.6
On Gas	7.4	27 cu.ft.	19.6

Other tests have shown that if the compression ratio is increased to 6.5:1, it is possible to obtain 85% of the power on gasoline, and even 90% if the hot spot in the induction system is removed; but without such modifications it is possible to say that the power loss lies between 15% and 20% for trucks with slow-running engines and 20% and 30% for light vans and private autos.

Coal Gas into Methane

Before concluding this brief survey of low and high-pressure gas, it is worth mentioning the research work carried out in Britain shortly before the war into the partial conversion of coal gas and coke-oven gas into methane, which practically doubled the range of the vehicle for a given storage and halved the cost of compression per therm of gas. After experimenting with numerous catalysts, a process was found for purifying the gas by passing it through silica gel and by using a catalyst consisting of nickel supported on charcoal made from sugar and using 1% cerium nitrate as promoter.

The resulting gas was tested on a motor van and consumption tests gave a figure of 13.2 cu.ft. per mile, compared with about 25 cu.ft. per mile with ordinary coal gas.

In general producer gas units are specially suited to heavy vehicles such as coaches, trucks, R.A.F. trailers, tractors and even barges; they are a perfectly satisfactory substitute for the gasoline-fired engine

even in its present early stage of development, but the economics are governed by such a large number of factors, many of them constantly changing, that it is hard to come to any hard and fast conclusions.

In the first place, optimum performance would need a specially designed engine and the most highly efficient fuel irrespective of its cost and availability, and in the midst of a gruelling war some owners will naturally fall short of the best results.

Question of Power Loss

Considering first the question of power, even with a higher compression ratio the lower calorific value of the gas means a power loss of 40% to 50% compared with gasoline. It is not only a question of lower maximum B.H.P. but a lower torque and therefore less pulling power. Also a long period of slow running in some cases leads to a poor gas when the engine is required to speed up again. Further limitations in the case of producers are due to the additional bulk and weight of the apparatus and the fact that the vehicle has to carry its own solid fuel. Nevertheless whole fleets of coaches are running to schedule on producer gas in certain parts of Britain with refuelling points at 100-150 mile intervals as a maximum.

The consumption of fuel varies with the size of the vehicle and the nature of the fuel. Various figures may be quoted. A truck with a gross laden weight of six tons consumes between 1½ to 2 lbs. of anthracite per mile. A 32-seater single-deck coach used less than 2 lbs. of solid fuel per mile and 0.1 gallons of gasoline. A Morris 12 auto fitted with a B.V.P. unit burned between 0.4 and 0.5 lbs. of Progasite per mile. With most sets a little gasoline is used for starting, but although this adds only slightly to the running costs, it is unnecessary since it has been found that a small electrically driven blower will achieve the same purpose in a very short time.

A more serious disadvantage of the producer gas unit is the high rate of cylinder wear due to the impurities in the gas. Recent developments in filtration have reduced cylinder wear to the same order as with gasoline. Filtration difficulties were accentuated by the use of activated fuels from which very finely divided sodium carbonate was entrained by the gas. This has now been overcome and filters are effective for 2,000 miles or more.

Economics of Gas Producers

Turning to the economics of gas producers, the conversion costs range between $300 and $800 according to the type and size of the set, but in the case of heavy vehicles the saving in fuel costs would be round about 1d (between 1 and 2 cents) a mile as compared with gasoline, so that for a yearly mileage of 24,000 the saving of $400 shows a good return on the capital outlay. The operating costs on the Eastern National Omnibus Co.'s depots shows a fuel bill of 1.37d per mile, including labor for treating the anthracite.

The extra cost of filling the hoppers and starting up amounts to .3d per mile, giving a total fuel cost of 1.67d per mile,

Fig. 2. Gas carburettor, showing method of fixing to the gasoline carburettor. The air flap is in the closed position for running on gas

compared with an equivalent gasoline cost of 2.75d per mile, and a diesel oil cost of 1.52d per mile. For an 8-ton gas truck running 500 to 600 miles a week, the running expenses worked out at 6¼d (just over 10 cents) to 6½d a mile, but the gross operating total, including all standing and establishment charges, was 8d (or just under 15 cents).

The possibility of greater efficiencies and maximum power outputs in the post-war years depends primarily on specially designed engines and on further improvements to the producer set. In its present form the producer gas vehicle cannot be expected to replace the gasoline car for certain types of transport service which demand the greatest possible peak power outputs, more acceleration and maximum flexibility.

As regards town gas, coke-oven gas, methane, or sludge gas from sewage, there seem to be great opportunities for the extended use of this sort of fuel for local deliveries and short-distance transport work in localities where compressors are installed. But such a development depends largely on an assurance that home-produced fuels will not be taxed. With a long-term policy based on this assurance, there is no doubt that many gasoline substitute fuels would be financially sound.

A.G.A. Technical Books Win British Praise

THE London *Gas Journal*, December 9, 1942, carried the following complimentary reference to publications of the Technical Section of the American Gas Association:

"The best news in the reports of the several (American Gas Association) Committees is that the excellent manual 'Fuel-Flue Gases' is to be revised within the next few years. This book first appeared in February, 1940, and within less than 18 months the original issue was sold out. The revision is entrusted to a Subcommittee under the chairmanship of Louis Shnidman, of the Rochester Gas and Electric Corporation.

"In the same report the revision of the Gas Chemists' Handbook is announced. This also is in the hands of a strong Subcommittee under the chairmanship of E. L. Sweeney, of the Boston Consolidated Gas Company. We gather that it is proposed to issue sections of the book as they are completed in the form of small volumes or individual pamphlets, of which at least five are expected to appear this year.

"The subject of gas analysis is to be treated in a separate volume to be prepared by Professor J. J. Morgan. Work on it is in progress but, naturally, there will be delay in the present difficult circumstances. The Synopsis of contents given in the report indicates that the new Gas Chemists' Handbook will be a great and comprehensive work. At any rate these books should be of considerable assistance to our own technicians when they come to the composition of the British Gas Industries Handbook which we all hope for after the war."

Revised Standard Code for Pressure Piping

COPIES of the revised 1942 American Standard Code for Pressure Piping (ASA B31.1—1942) have just been released by the American Society of Mechanical Engineers, 29 West 39th St., New York City. Published in handy book size, 218 pages, illustrated and indexed, the new pressure piping code covers the many significant changes in piping practice which have taken place since this ASA safety project was first issued as a tentative American standard in 1935. This code climaxes a series of developments dating from 1916 when the Power Piping Society published the first standard specifications for power piping.

Representing the American Gas Association on the Sectional Committee on the Code for Pressure Piping and contributing greatly to its work were Frederick A. Lydecker, general superintendent of gas distribution, Public Service Electric & Gas Co., Newark, N. J., who served as secretary, and J. S. Haug, consulting gas engineer, United Engineers & Constructors, Inc., Philadelphia, who was chairman of the Subcommittee on Gas and Air Piping.

Among the changes which have taken place since the code was originally published in 1935, are the following: welded joints have assumed increasing importance, standard dimensions have been prescribed for factory-made butt-welding and socket-welding fittings and their use has become common practice, welding-end valves with welded bonnets have been developed and adopted, pressures and temperatures have advanced to new high points, new material specifications and dimensional standards have been formulated, and numerous other changes have taken place.

In addition to the complete revision of

the several sections of the code, a new section on refrigeration piping systems has been included, and a new chapter on welded branch connections and fabricated or cast specials has been added to the section on fabrication details.

The Code for Pressure Piping represents a standard of minimum safety requirements for: (1) the selection of suitable materials and reference to standard specifications by which they may be secured; (2) the designation of proper dimensional standards for the elements comprising piping systems; (3) the design of the component parts as well as the assembled unit including necessary supports; (4) the erection of these systems; and (5) the test of the elements before erection and of completed systems after erection.

The principal purpose of the code is to serve as a guide to state and municipal authorities in the drafting of their regulations and it may be adopted by them in whole or in part. The code will serve also as a standard of reference for minimum safety requirements by equipment manufacturers, architects, engineers, erectors, and others concerned with pressure piping.

FOOD DEHYDRATION

(Continued from page 57)

above that of the outside air as drying efficiency may be greatly retarded on humid summer days particularly in the important last stage drying.

It is during the last stages of drying when the product gives up its moisture slowly that there is danger of cooking. Therefore the temperature must be held down but the moisture must be taken up as rapidly as possible. This means that very dry air is of great value and makes evident the need for gas-fired air dehumidification equipment.

A number of products after being dehydrated are in hygroscopic state; that is, they re-absorb water very readily from surrounding air. Therefore, it becomes desirable to maintain air of low humidity in storage and packaging rooms to prevent a regain in moisture content. Fortunately, applicable gas-operated dehumidification units, which have already solved a wide variety of humidity control problems, were developed several years ago and are readily available. Gas is being used now for food dehydration, both directly and through steam generation.

The gas industry can be of real help to this receptive industry by making available its wide experience in the field of scientific heat application

Reprinted from *Collier's*

through the engineers in the Industrial and Commercial Departments. The food industry can be developed into a big user of gas in this new field and we of the gas industry can be of great service to the war cause by helping to solve some of the problems with which they are confronted in their struggle to meet the tremendous demand for production.

The Home Service Departments too can be of real help to the housewives in the future if they will investigate now the possibilities and home kitchen preparation technique for dehydrated foods.

Remember too, that fruits and vegetables are distinctly summer crops and require processing immediately after reaching maturity. The gas load is primarily a summer load with off peak characteristics.

SYNTHETIC PRODUCTS FROM NATURAL GAS

(Continued from page 72)

lotted per inhabitant per month, and much of it comes from this paraffin wax. In 1938 and previous years also, conversion of paraffin wax from the water gas reaction, coal carbonization, and petroleum, was carried out forming fatty acids. In addition, these fatty acids are combined with synthetic glycerine to make *fats for food*. Glycerine and soap are produced (U. S.) from the splitting of fats, but the Germans are reversing the process in order to produce edible fats for food. It is not the type of fats to which we are accustomed, but it is helpful under the critical food conditions existing in Europe.

An enormous amount of research is going forward in a study of natural gas and gasoline to enhance their importance in the war effort—through solvents, plastics, high explosives, acetylene, synthetic rubber, lubricating oils, and aviation gasoline. As a matter of fact, if one starts with methane gas alone, all of the known synthetic products that man has produced in organic chemistry can be derived, and there are over 500,000 different ones. *Any synthetic product desired can be produced at a price;* the hydrocarbons are all potentially available to be converted into the manifold products that man requires in a modern world.

P. C. G. A. Proceedings

THE annual Proceedings of the Pacific Coast Gas Association covering the activities of that organization for the fiscal year 1942 have just been published. The contents include a summary of the forty-ninth annual meeting held in San Francisco, Sept. 4, and valuable papers and committee reports presented during the year. While Accounting and Sales and Advertising Sections are represented, the bulk of the 117 printed pages of the volume is devoted to distribution, transmission and utilization reports of the Technical Section.

Officers of the Pacific Coast Gas Association during the year covered by the 1942 Proceedings were: president, R. S. Fuller, San Francisco; vice-president, F. M. Banks, Los Angeles; treasurer, D. G. Martin, San Francisco; and managing director, Clifford Johnstone, San Francisco.

Personnel Service

SERVICES OFFERED

Technical administrative position desired. M.E., married, two children, III-B military classification. Experience: gas manufacture and distribution; sales and service of commercial and industrial installations using manufactured, natural, and liquefied gas; supervised research in industrial gas and all phases of petroleum (39). **1453.**

Registered Professional Engineer, 20 years' experience oil and gas, U. S. and abroad, expert Spanish, draft-exempt, available as **consultant, manager, engineer,** geologist. **1454.**

Position wanted as **gas engineer** or as **manager** of gas operations. Engineering graduate with 20 years' experience as industrial gas salesman, superintendent of distribution and gas engineer. Draft status 3A. Available on reasonable notice. **1455.**

Wanted—position as local **gas company manager.** My experience has brought me in contact with all the duties of the general and local office; street main—service meters—sales and service. Confidential classification Record on file at A. G. A. Headquarters. **1456.**

Twenty-five years' experience as an **operator** and **executive** with utility companies handling natural gas, oil gas manufacturing and liquefied petroleum gases covering all phases of operation, production, transmission and distribution. Technical education, married with family and excellent health. Will locate any place in job of responsibility. A-1 references. **1457.**

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